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EXPERIMENTAL STUDY IN INSTRUCTIONAL PROCEDURES. SECOND REPORT.

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THE EFFECTIVENESS AND FEASIBILITY OF USING CERTAIN TYPES OF LARGE GROUP INSTRUCTION AT THE COLLEGE LEVEL WERE STUDIED. COURSES WERE TAUGHT (1) BY TELEVISION, (2) BY LECTURE, (3) BY A PROBLEM OR CASE STUDY APPROACH, AND (4) BY GRADUATE STUDENT ASSISTANTS. EVALUATIONS INVOLVED COMPARISONS BETWEEN THESE EXPERIMENTAL METHODS AND CONVENTIONAL INSTRUCTION. FOR MATCHING PURPOSES, STUDENTS TOOK THE COOPERATIVE TEST OF ENGLISH ACHIEVEMENT, THE COOPERATIVE MATHEMATICS PLACEMENT TEST, AND THE AMERICAN COUNCIL ON EDUCATION EXAMINATION FOR COLLEGE FRESHMEN. IN GENERAL, NO GREAT DIFFERENCE WAS FOUND BETWEEN ACADEMIC ACHIEVEMENT IN EXPERIMENTAL AND CONTROL CLASSES. STUDENT ATTITUDES TOWARDS COURSES AND INSTRUCTORS WERE MEASURED ON A C-SCALE. THE INSTRUCTOR WAS A MAJOR DETERMINANT OF STUDENT REACTION. GENERALLY, STUDENTS PREFERRED CONVENTIONAL (SMALL) CLASSES. (MS)

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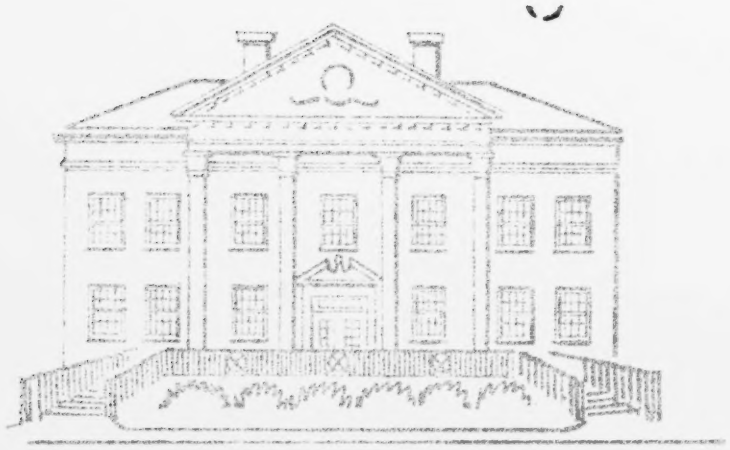

EXPERIMENTAL STUDY IN INSTRUCTIONAL PROCEDURES

MIAMI UNIVERSITY

Under Grant From FUND FOR THE ADVANCEMENT OF EDUCATION

Experimental Study

In Instructional Procedures

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Project under Grant from

The Fund for the Advancement of Education

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MIAMI UNIVERSITY OXFORD, OHIO

OCTOBER 1, 1957

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Second Report

Miami University Experimental Study In Instructional Procedures

Section I. Summary of Findings and Tentative Conclusions

This section contains a summary of findings and conclusions, some of which still are quite tentative. Data to support these findings are presented in subsequent sections. Some conclusions, by the very nature of the situations out of which they develop, are based upon observation and experience rather than upon empirical data. Persons unfamiliar with the scope and purpose of the Study will find it helpful to read Section II prior to reading this section.

1. Instructional Method and Facilities.

a. Contrary to much popular opinion, college professors are keenly interested in improving their course organization, methods of instruction and means of evaluating student progress. Voluntary summer workshops for this purpose have been exceptionally well attended and greatly appreciated by participating faculty. Also, consultive services during the school year are in constant demand.

b. College professors, with many notable exceptions, make inadequate use of audio-visual aids. A principal cause is that such aids are not readily available. Adequate facilities, equipment and personnel for the production of instructional materials are to be found on few college campuses. The use of audio-visual aids increases greatly when these may be readily obtained and when technical assistance is available for instructors unfamiliar with such equipment as overhead projectors, tape recorders and microprojectors.

c. Television, while proven to be an effective medium of communication for instructional purposes, is seldom economical for small group instruction. Consequently, its general use probably will be restricted to those courses enrolling large numbers of students. Lest this statement be misinterpreted, it is entirely feasible through chain telecasting to teach courses of small enrollment simultaneously on several campuses. Kinescopes may be used campus by campus but still are of doubtful economy for small classes.

d. Teaching through television is far more demanding upon teacher time than is conventional instruction in either small or large classes. Certainly, a credit hour load allotment of approximately three-fourths the total load for a televised course is not unreasonable. Many television teachers insist, and with good argument, that one three-credit television course should constitute the full teaching load.

e. Teaching a large class other than through television is more demanding than teaching a small class in the same subject area. The method of instruction used greatly affects the expenditure of effort, however. The amount of time necessary to develop cases and problems, to consult with individuals and groups, and to give needed assistance in related student research is much greater than the time required to handle the course by lecture. This should be recognized either through an increased credit allowance on teaching load or through the assignment of qualified students to assist in the teaching and management of the course. The latter procedure is probably more desirable, especially if there is a shortage of well-qualified teachers in a subject field.

f. Most university classrooms are poorly suited to large group instruction. This is especially true of large classes taught by methods other than lecture. Few universities indeed have large rooms planned especially to facilitate the case or problem approach to large group teaching. Also, much of the effectiveness of televised instruction is lost through lack of suitable rooms for TV reception. Hence any experimental teaching utilizing TV or a case or problem procedure operates under the severe handicap of having to be done in rooms planned either for conventional small classes or for lecture or lecture-demonstration classes.

2. Achievement.

Achievement, for the purposes of this Study, has been divided into three categories. These include the definition of achievement in terms of acquisition of basic knowledge about the subject matter; in terms of the ability to solve problems within the subject-area; and in terms of the development of desired attitudes (or overcoming of stereotypes) within the field of study. The first of these criteria of achievement was employed in the evaluation of all courses. The latter two criteria were employed in selected courses.

a. When the data for the three semesters of investigation to date are considered in toto, it is apparent that students in TV sections acquire about as much of the basic subject matter knowledge as do those assigned to control sections of the same courses. Exceptions to this generalization appeared during the second semester 1956-1957 in three of the four TV courses under investigation. Students in the control sections of these courses averaged higher final examination scores than did those in the TV sections. Since this finding is unique to just one of the three semesters, replication is desirable before attempting an interpretation.

Acquisition of subject-matter knowledge is not adversely affected by assignment to a large class rather than to a small control section. This has been a consistent finding for all three semesters of investigation to date.

The effectiveness of instruction by graduate assistants in contrast to that by regular faculty members is still an open issue. Students in sections of Introduction to Business taught by graduate assistants were found to average about the same score on the final examination as did those students in control sections taught by faculty members. In Introduction to Geology, however, achievement in sections taught by graduate assistants was inferior to achievement in the control sections.

b. Achievement defined as the ability to solve problems and think critically in the subject-area was investigated in three of the TV courses. TV instruction was found to be somewhat inferior to control instruction in Economics, but not in either of the other two courses. Additional data pertaining to this criterion for TV courses will become available next year.

When the same criterion was investigated in large classes, it was found that large class instruction compared favorably with control instruction.

c. The development of course-related attitudes was investigated in three courses included in the large class phase of the Study. Large class instruction was found to be somewhat inferior to control instruction in this regard in two of the three courses.

d. The interaction between section assignment and two additional factors as joint determinants of achievement was investigated. The first of these factors was level of academic ability. In general, there is no justification for selecting students for assignment to TV or large class sections on the basis of their ability. (This generalization, however, may be subject to exception in certain specific courses.) The second factor, students' attitudes toward the method of instruction, did not influence achievement in any of the courses.

3. Attitudes About the Course and the Instructor.

a. Class size alone does not exert a systematic and uniform effect upon student attitudes toward the course. These attitudes appear to be influenced by other factors, including specific course content and ability of individual instructors to handle larger groups of students.

b. Student motivation and interest in the specific subject matter is not significantly diminished when the course is presented on TV or in large classes for one semester. Whether or not a similar conclusion is warranted at the end of the second semester of full year courses remains an open issue.

c. There is a pronounced tendency for instructors to be rated as more effective by their students in control sections than in TV or large classes. Again, however, this generalization does not by any means hold for all instructors.

4. Attitudes About TV and Large Class Instruction.

a. It is possible to teach a TV course in such a way that students actually prefer it to conventional instruction. This requires a unique combination of instructor, course material and the full use of the potentialities of television as an instructional medium. As a general rule, however, most students enrolled in TV sections and in large classes would prefer to be in a conventional (small) class.

b. Attitudes about the means of instruction are much more variable between TV courses than between courses offered in large classes. The prevailing attitude toward TV instruction as compared to control instruction ranges from strong enthusiasm to extreme displeasure. The prevailing attitude toward large class instruction as compared to control instruction is mildly unfavorable.

c. The instructor is a major determinant of student attitudes about TV and large class instruction. There is a pronounced tendency for students who dislike their instructor to dislike TV or large classes and vice versa. The majority of students say they would enroll in a TV class or a large class (even though they prefer small classes) if it meant that they would be assured of being taught by an excellent instructor.

d. Students in TV courses tend to become progressively disenchanted with television as a means of instruction as the year progresses. Most students reported that they neither learned as much nor were as attentive during the TV presentations as they had originally anticipated. Furthermore, more students are inclined to favor conventional instruction over TV instruction at the end of the second semester than at the end of the first semester.

The same kind of progressive disenchantment was not characteristic of students in large classes.

e. Attitudes about TV and large class instruction are independent of students' level of academic ability.

f. Preliminary student biases about TV instruction persisted throughout the academic year. Those students who were least favorable at the beginning of the course remained so at the end of the course. Similarly, those most favorable initially were most favorable at the end of the year.

5. Instructors' Attitudes.

Virtually all instructors who have tried TV teaching like it better than they thought they would. Although they would still prefer to teach conventional classes, there is considerable feeling that TV classes are superior to other large group teaching procedures. The major defects inherent in TV, as far as the instructors are concerned, are related to the physical barrier between student and teacher and the lengthy preparation time required for each TV presentation. The latter objection can probably be overcome by making load adjustments. The former objection, however, is much more basic because it implies a lack of satisfaction of one of the basic needs impelling many individuals to select teaching as a profession. Teaching on TV does offer certain compensatory satisfactions which may be sufficient to provide "psychic income" for a number of instructors. There is a core of teachers, however, who probably could never be so compensated for transfer from the classroom to the studio.

Instructors in large classes reported pretty much the same weaknesses as did the TV instructors, with two exceptions: (1) Preparation time for large classes is not as disproportionately lengthy as it is for TV classes, and (2) the physical barrier between student and teacher is not as severe as it is in TV classes. Again, however, most of these instructors reported that large classes did not give them the same feeling of personal satisfaction and accomplishment as did small classes.

Dr. James V. Mitchell leads panel discussion in Educational Psychology.

Dr. Walter C. McNelly in Introductory Physiology.

Section II. Scope and Experimental Design

1. Support of the Study.

This Study is supported jointly by Miami University and The Fund for the Advancement of Education. A proposal for the Study was made to the Fund during the late summer of 1955, and an initial grant of $135,000 was received effective November 1, 1955. A subsequent grant of $150,000 was made to Miami University by the Fund to cover the period of July 1, 1957 to June 30, 1959, at which time the Study will be officially completed.

2. Purpose of the Study.

The purpose and need for the Study were stated in some detail in the Progress Report published by Miami University under date of October 1, 1956. This report will be referred to hereinafter as the Progress Report. Stated briefly, the Study was undertaken primarily for the purpose of studying the effectiveness of certain types of large group instruction, and to demonstrate the feasibility of these procedures at the college level. Much of the energy of the ESIP (Experimental Study in Instructional Procedures) staff has been devoted to developing evaluative instruments, to making evaluative studies to determine the relative effectiveness of large and small group teaching, and to assisting participating instructors in improving their own course organization and evaluative tools and procedures. These efforts will continue, with special attention to evaluating the so-called "intangible" objectives of teaching. It is expected that off-campus teaching will be inaugurated upon completion of open circuit facilities. In addition considerable attention will be given to the improvement of instruction of large groups, encompassing methodology, instructional materials, and facilities. The improvement of teaching through television so that the fullest potentialities of this medium of communication may be utilized will constitute a major effort. This is particularly important in view of the findings that while instruction through TV can be highly effective, it is not yet favorably received by the majority of college students. The ESIP staff is convinced that both satisfactory achievement and favorable student reaction are possible, but that most courses need reorganization to fit this medium of instruction with procedures and materials better suited to TV than is now generally the case. An important part of the Study has been the development of more nearly adequate audio-visual facilities and services, and the encouragement of faculty in the production and use of improved instructional materials and equipment.

3. The Scope of the Study.

The Study has been concerned chiefly with the following types of large group instructional procedures: (a) courses taught through television, (b) courses taught predominantly by the lecture method, (c) courses taught by a

problem or case study approach, (d) courses with multiple sections taught by graduate assistants and supervised by regular faculty members. During the present year one of the large Geography sections has been changed from a lecture class to a map study group with much of the work organized around map problems. An experimental class, with a control section, has been organized in Government in which the students of the experimental class will do most of their work individually, meeting only occasionally with the instructor for guidance and problem clarification.

A complete listing of courses, with sections and enrollments, was included in last year's Progress Report. The courses included in the Study during the academic year of 1956-1957 are listed in Table 1 of this report. Included in the Study were 23 separate courses, many of them taught in multiple sections, 20 different departments of the University, and an approximate total student enrollment of 4457.

4. Teaching Procedures.

For the purposes of reporting, courses included in the Study are categorized into the following types:

a. Courses taught by television. These will usually be identified simply as TV.

b. Large courses other than TV courses. These include both the courses which were primarily lecture courses and those taught by the case or problem procedure.

c. Courses taught by graduate student assistants. These will be referred to later as GS.

The above classification does not indicate the full range of teaching procedures. Instructors were encouraged to develop classroom techniques and materials which were best calculated to achieve course objectives. The TV courses, for example, were taught in diverse ways. Foundations of Human Behavior met for two weekly periods of ninety minutes each, with discussion (led by graduate student assistant instructors) integrated into the fabric of TV presentations. Televised presentations were made three times a week for fifty minute periods in Physiology with virtually no classroom discussion. Students in this course did, however, attend a weekly two-hour laboratory session wherein they were given an opportunity to raise questions. Economics was convened for three weekly fifty-minute sessions, two of which consisted of TV presentations. The third class meeting each week was devoted entirely to discussion conducted by a regular member of the faculty of the Department of Economics.

A similar heterogeneity of procedure was also characteristic of those courses taught as large groups without television. In the large sections of English, for example, essentially the same procedure was followed as that employed in small sections, except that only half as many written themes were required of each student. In Geography, the general procedure consisted of two lectures per week with a third period devoted to small group discussion. Some of the courses included in this phase of the Study readily lent themselves to a "case study" or "problem" approach (e. g., Marketing, Business, Social Studies and Government) whereas others were conducted primarily as lectures with varying degrees of in-class discussion.

This diversity of approach is considered desirable and necessary even though it obviates direct comparisons between courses. It is a simple fact that instructors and courses cannot and should not be cast in a mold. Procedures that are useful and comfortable for one instructor should not be imposed upon another instructor teaching either the same or a different subject-matter.

All evaluations described herein involve comparisons between experimental course instruction (TV, LC or GS) and conventional (control) instruction, the latter consisting of classes of 25-35 students.

The control sections for every course in the TV and LC phases of the Study were taught by the instructor responsible for the experimental section. Comparative data were obtained to determine how well the objectives of the course were satisfied when a given instructor taught a specific course experimentally and conventionally.

The control sections for courses in the GS phase of the Study were comparable in size to the experimental sections, but were taught by full-time faculty members rather than by graduate student assistants. The basic comparison here involved was the attainment of course objectives by students attending sections taught by graduate assistants and by students attending sections conducted by regular faculty members.

5. Equating Experimental and Control Sections.

Since many of the analyses required a comparison of data obtained from experimental and control sections, it is apparent that proper interpretations of findings presuppose the existence of equated sections within each course. The variables employed for matching purposes in all courses included the Cooperative Test of English Achievement (Eng.), Cooperative Mathematics Placement Test (Math) and the American Council on Education Examination for College Freshmen (ACE). These three tests are routinely administered to incoming freshmen at Miami University. In addition a brief pretest of subject-matter knowledge was administered in a number of courses and the experimental and control sections of virtually all courses were demonstrated to be equated with respect to proportional distributions by sex and class standing.

Since the equating process was completed after registration, the experimental and control groups represent samples of the total course enrollments. Thus, the sizes of the experimental and control groups employed for the analyses are smaller than the actual enrollments in these sections. It is important to note that neither the instructors nor the students were aware of the identity of persons enrolled in a course but excluded from the sample under investigation. Furthermore, the matching and accompanying decisions about constituency of the samples was effected prior to the collection of data on achievement and attitudes.

Most of the courses included in the Study were full year courses. The matching procedures employed during the second semester were identical to those employed at the beginning of the academic year with one additional feature. Students included in an experimental or control sample during the second semester were all included in the same sample during the first semester. In order to be considered for inclusion in the TV sample of a course for the second semester, for example, a student must have been a part of the TV sample of this course for the first semester. This requirement insured the demonstration of the effects of assignment to an experimental section for a full year. Furthermore, it eliminated a potential source of data confusion resulting from students switching sections in mid-semester.

6. Design for Evaluation.

Four primary areas of investigation were included within the scope of the ESIP program during 1956-1957. These areas and the specific problems included within each are described in detail below.

a. Achievement.

In the ESIP Progress Report achievement was defined as performance on the course examinations administered for the purpose of assigning final grades. Such examinations typically are valid for measuring only a single dimension of achievement which might be termed "subject-matter knowledge". Although this is undoubtedly an important area for evaluation, it does not by any means encompass the range of achievements instructors hope to accomplish in their courses.

Course examinations typically do not measure adequately in the areas of "synthesis", "problem-solving" and "critical thinking". These areas are not so much dependent upon a student's ability to recall basic facts and principles as they are upon his ability to integrate and utilize the concepts acquired in the course. As a result of cooperative efforts by the participating faculty members, the staff of ESIP and visiting consultants, some results concerning these so-called "intangible achievements" are herein reported for a number of

courses. In several instances, the evaluation of attainment of these objectives was based upon administration of subjective (essay) examinations. Whenever subjectively scored measures of achievement were employed, they were scored independently by at least two readers and appropriate safeguards against halo effects were observed.

Another aspect of "intangible" achievement was the matter of change in course-related attitudes. Instructors in three courses claimed the objective of overcoming stereotypes as a course aim. Consequently, brief measures of stereotype were administered to students in the experimental and control sections of these courses both at the beginning and at the end of the course.

In summary, the specific problems relating instructional procedures to achievement are listed below. Data regarding these problems are presented in Section III.

> Problem 1: How did performance on subject-matter knowledge tests compare for those students assigned to experimental sections (either TV, LC or GS) and those assigned to control sections?
>
> Problem 2: How did performance on tests of critical thinking, problem solving and synthesis compare for students assigned to experimental and control sections of certain courses?
>
> Problem 3: How did performance on measures of course-related attitudes compare for those students assigned to experimental and control sections of certain courses?
>
> Problem 4: Is there a relationship between students' level of academic ability and their comparative achievement in experimental and control sections?
>
> Problem 5: Was achievement in the TV and LC sections related to student attitudes about receiving experimental rather than conventional instruction?

b. Student Reaction to the Course Content and to the Instructor.

Opponents of large-group instruction frequently object to such "mass education" because it is presumed to inhibit or eliminate the ability of the teacher to awaken and fan the spark of interest which may lead to a vocational career in the particular subject-matter field. Are we sacrificing student motivation and interest when we assign students to large classes (including TV) or classes taught by novice instructors (graduate student assistants) rather than to sections of conventional size taught by full-time faculty members?

The specific problems relating instructional procedures to student attitudes about the course and the instructor are enumerated below. Data regarding these problems are presented in Section IV.

Problem 6: Were student attitudes about the course influenced by assignment to an experimental rather than to a control section?

Problem 7: Did students report differential levels of motivation and interest as a result of assignment to experimental rather than to control sections?

Problem 8: Were student attitudes about the relative effectiveness of their instructor influenced by assignment to an experimental rather than to a control section?

Problem 9: What is the effect of instructional procedure upon specific criteria of teacher effectiveness?

c. Student Attitudes About TV and LC Instruction per se.

It is of considerable interest to know how students feel about receiving instruction in large groups rather than in conventional sections. Strongly unfavorable student attitudes about either TV or LC instruction, if present, would represent a serious public relations problem apart from any carry-over from attitude to achievement. It is important, in addition, to become cognizant of those specific features of TV and LC instruction which constitute strengths and weaknesses as far as the students are concerned. Finally, it is of value to gain information about the factors which condition or influence student attitudes about the mode of instruction.

Specific problems in these areas are cited below and discussed in Section V.

Problem 10: What were the overall student evaluations of the effectiveness of TV and LC instruction at the end of the semester?

Problem 11: What specific features were considered by the students to be strengths and weaknesses of TV and LC instruction?

Problem 12: To what extent did student opinion about TV and LC instruction change from beginning to end of the course (or semester)?

Problem 13: Were student attitudes about TV or LC instruction related to their feelings about their instructor?

Problem 14: Were student attitudes about TV or LC instruction related to their level of academic ability?

Problem 15: Were student attitudes toward TV instruction related to the attitudes of the assistant instructors in charge of the receiving rooms?

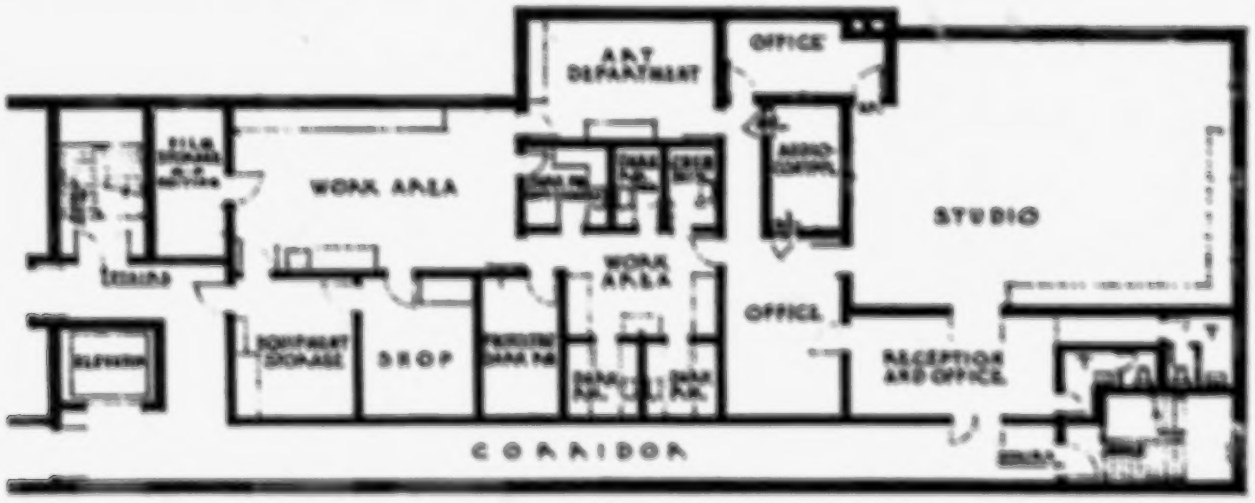
Problem 16: Were student attitudes toward TV instruction related to their pre-semester biases about assignment to an experimental rather than to a conventional section?

d. Instructor Attitudes About Teaching TV and LC Sections.

Student attitudes and opinions about large-group instruction are both valuable and important. The picture is incomplete, however, without examination of the other side of the coin: i. e., how instructors react to large group teaching. Consequently, the final problem, which is discussed in Section VI of this Report, is

Problem 17: How did the instructors react to teaching TV and LC sections?

The foregoing enumeration of problems has indicated the range of evaluative investigations included within the scope of ESIP during the 1956-1957 academic year. Several of these same problems were investigated during the spring semester of 1955-1956 and were reported in the earlier Progress Report. Findings, when appropriate, will be based upon the data gathered throughout the Study, although the data presented in the earlier Progress Report will not be duplicated here.



Floor Plans for Audio-Visual Service
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Section III. Evaluation of Achievement

Problem 1: Comparative scores on subject-matter knowledge tests of students in experimental sections (TV, LC or GS) and in control sections.

The criteria of achievement, defined as acquisition of subject-matter knowledge, were the course examinations administered for the purpose of assigning final grades. Many of these examinations were objective in nature. They were most often directed toward recall of facts and principles rather than toward synthesis or integration. Data obtained for similar examinations administered last year indicated that this type of instrument possesses satisfactory reliability.

The possibility of leakage of test information was overcome by simultaneous administration of each examination to experimental and control sections of each course.

The distributions of these test scores in the experimental and control sections as well as appropriate t-ratios are summarized in Table 1. Data for each of the semesters of the 1956-1957 academic year are presented separately within this table. In certain courses, the apparent size of the control group exceeds 30-35 students typical of conventional sections (e. g., Economics, Composition and Literature, Geography, Mathematics, Psychology, Zoology and Introduction to Business). This resulted from some instructors' having more than one control section.

The findings reported in Table 1 are discussed separately for TV courses, LC courses and GS courses.

a. TV Courses. There is a small degree of loss in acquisition of subject-matter knowledge during the first semester when students are assigned to TV rather than to conventional sections. Somewhat lowered achievement as a result of TV instruction is evident in three of the four courses under investigation. The degree of loss was minimal and did not produce significant t-ratios for any course.

The consistency of the trend is meaningful, however, because of the data obtained at the end of the second semester. At this time, subject-matter-achievement was significantly greater in the control sections than in the TV sections of Foundations of Human Behavior and Economics. A significant difference in favor of the control section of Air Science was also obtained on one of the two parts of the final examination.

Heretofore, most research on this issue at Miami University and elsewhere has indicated that the final examination scores of students in TV and

TABLE 1

COMPARISON OF SCORES ON SUBJECT-MATTER OBJECTIVE TESTS IN EXPERIMENTAL AND CONTROL SECTIONS

Course	Section	First Semester: '56-'57 Exam.[1]	N	S.D.	M	t-ratio	Second Semester: '56-'57 Exam.[1]	N	S.D.	M	t-ratio
Foundations of Human Behavior	TV	Final	160	15.72	113.98	1.00	Final	140	19.15	145.10	2.21*
	Control		32	13.80	116.88			27	14.53	153.56	
Physiology	TV	Final	191	8.61	60.83	1.44	Final	137	8.21	74.67	0.49
	Control		36	9.70	63.14			27	9.29	75.63	
Air Science	TV	Aviation	98	6.68	61.43	0.74	International	79	9.27	73.60	0.66
	Control		31	7.65	60.97		Tensions	27	8.87	74.96	
	TV	Geography	98	10.98	92.61	0.00	Military	79	8.63	67.98	2.69**
	Control		31	13.72	92.55		Instruments	27	9.28	73.33	
Economics (TV/LC)[2]	TV	Final	141	5.20	35.54	1.51					
	Control		48	4.14	36.81						
Economics (LC/TV)[3]	TV						Final	112	5.54	34.05	3.04***
	Control							40	5.48	36.93	
Economics (TV/LC)[2]	LC						Final	90	6.25	35.98	0.87
	Control							32	5.90	37.27	
Economics (LC/TV)[3]	LC	Final	157	4.89	35.82	0.02					
	Control		64	4.28	35.84						
Business and Government[4]	LC	Final	81	9.41	65.31	0.50	Final	53	7.18	67.68	0.16
	Control		26	8.42	64.27			25	10.29	67.20	
Introductory Chemistry	LC	Final	134	29.67	115.68	1.06	Final	92	28.95	78.92	0.09
	Control		23	33.41	123.00			16	33.45	78.12	
Teaching Principles & Practices (Elem.)	LC						Final	45	7.68	48.73	1.99
	Control							27	4.35	51.59	
Composition and Literature	LC	Final	138	5.18	34.66	0.50	Final	99	6.56	39.76	1.44
	Control		84	5.26	34.06			52	5.65	41.31	
Essentials of Geography	LC	Final	296	10.53	71.88	1.10	Final	207	9.52	70.01	0.23
	Control		74	11.20	73.18			42	10.23	69.93	
Government	LC	Final	39	11.21	74.23	0.47					
	Control		17	8.97	75.71						

Mathematics	LC	Final	77	15.41	59.47	0.31	Final	42	4.71	14.05#	0.57
	Control		65	15.10	58.94			36	4.07	13.47#	
Physics	LC	Final	73	15.86	69.47	0.00	Final	93	10.84	74.34	0.34
	Control		33	18.99	69.48			24	13.58	75.38	
Introductory Psychology	LC	Final	88	21.14	97.44	0.47	Final	56	15.09	106.75	0.95
	Control		53	15.34	98.96			30	8.66	109.63	
Social Studies	LC	Final	50	14.24	51.16	1.58	Final	30	14.94	71.27	0.33
	Control		38	11.84	55.74			30	13.96	70.03	
Introductory Sociology[6]	LC						Final	58	18.93	176.81	0.49
	Control							30	22.93	174.43	
Zoology	LC	Final	135	13.47	62.77	0.18	Final	102	13.01	64.04	2.30
	Control		64	13.46	63.16			47	11.25	69.15	
Classics	LC	Final	49	11.55	82.10	1.33					
	Control		32	8.55	85.16						
Elementary French	LC	Oral	31	5.55	38.81	0.68					
	Control		19	5.80	37.68						
	LC	Grammar	31	10.85	51.68	0.37					
	Control		19	8.32	52.42						
Elementary French	LC	Reading Comp.	31	13.07	93.39	0.16					
	Control		19	11.18	92.84						
Introduction to Business	GS	Final	151	16.25	102.84	0.26	Final	96	14.09	110.63	0.56
	Control		138	15.28	103.18			104	14.40	111.77	
Introductory Geology	GS	Final	117	10.17	64.02	2.06*	Final	70	10.32	58.26	1.61
	Control		30	10.45	68.37			19	7.60	62.79	

1. The criterion was the total final examination except in those courses where subtests are specified.
2. Economics (TV/LC) was taught as a TV course during the First Semester and as a LC course during the Second Semester.
3. Economics (LC/TV) was taught as a LC course during the First Semester and as a TV course during the Second Semester.
4. This was a one-semester course offered each semester.
5. The LC and Control sections of these two courses were offered during successive semesters rather than simultaneously.
6. This course was included in the Study only during the second semester.

This test consisted of 20 algebraic problems weighted one point each.

* $p < .05$ ** $p < .01$ *** $p < .001$

control sections are comparable. The current data, however, indicate that there is a degree of loss in subject-matter knowledge of students receiving TV rather than conventional instruction. This loss does not occur in all courses (see data for Physiology) but it is frequent enough to be noteworthy. Furthermore it appears to be cumulative, occurring at the end of the second semester of the full year sequence. Interpretation of this finding awaits replication.

b. Large Classes: A sizeable number of courses representing a variety of content were offered both to large sections and conventional sections. In general, LC and conventional instruction were about equally effective for acquisition of subject-matter knowledge. The only exception to this generalization occurred in Zoology second semester wherein the mean test score in the control section was significantly higher than that in the LC section.

c. GS Courses: Only two courses (Introduction to Business and Introductory Geology) were offered under this phase of the program. In the former instance, five control sections were taught by two faculty members and twelve experimental sections were each taught by five graduate student assistants. Performance of the students in the five control sections was compared with the performance of students in five of the twelve experimental sections. The resultant data for Business are indicative of equivalent subject-matter achievement in experimental and control sections.

In Geology, four GS sections (drawn from a pool of twelve such sections) each taught by a different graduate assistant, were compared against a single control section. The data indicate somewhat inferior achievement of students assigned to GS sections. This finding for Geology would not be especially noteworthy in view of the small control group except for the fact that it replicates data obtained last year.

Problem 2: Comparative scores on tests of synthesis, problem-solving and critical thinking of students in experimental and control sections.

The evaluative instruments employed for this phase of the Study were somewhat different in nature from those measuring "subject-matter knowledge". All of the measures of "synthesis" and "problem solving" were designed to evaluate the ability of students to use the basic facts and principles learned in the course. The ability to simply recall these facts and principles did not contribute substantially to the score on these tests. A brief description of each of the measures is given below. The first three tests listed were products of the Cooperative Study of Evaluation in General Education, conducted under the auspices of the American Council on Education and directed by Dr. Paul L. Dressel. The remaining tests were developed by instructors at Miami University.

a. Test of Critical Thinking in Social Science: A multiple-choice test ". . . designed to measure students' ability to demonstrate several skills involved in critical thinking within the context of the social sciences." Administered at the end of the year.

b. Test of Science Reasoning and Understanding - Natural Sciences - Form C: A multiple-choice test ". . . designed to measure students' ability to read and interpret scientific material written in popular style, and to apply scientific information to new situations." Administered at the end of the year.

c. Test of Science Reasoning and Understanding - Biological Sciences - Form A: Comparable in nature to Form C described above, except that the content is restricted to the biological sciences. Administered at the end of the year.

d. Case Study Examinations in Marketing: Three essay examinations administered at approximately four week intervals starting at mid-semester. Each examination consisted of a presentation of a 1 and 1/2 to 2 page mimeographed case or problem in marketing. Students were directed to solve the problem in the capacity of consultant. They were cautioned not to write a statement of the case, pertinent facts, etc., as such. They were, rather, to discuss only the arguments, reasoning and analysis necessary to support their recommendations.

e. Case Study Examination in Business and Government: An essay examination consisting of two legal cases involving an appeal to the Supreme Court. Students were required to state the issue (or issues) and to decide the case, citing the Constitution and rules of law from other cases to support their decision. Administered near the end of the course and replicated in two sections.

f. Synthesis in Sociology: An essay examination consisting of three selections. The directions to students read as follows: "In this examination you will have an opportunity to apply the sociological approach and sociological principles to three concrete situations . . . State applicable generalizations. Suggest hypotheses which are related to these generalizations. . . A 'common-sense' analysis such as you would have been able to write prior to taking the course will receive no credit." Administered at the end of the year.

g. Synthesis in Economics: Three essay examinations consisting of questions designed to measure the ability of students to integrate materials learned in the course. These were administered in the middle of the first semester, at the end of the first semester and at the close of the second semester.

h. Themes for Composition and Literature: Students were required to write four themes for experimental purposes: one at the beginning of each

semester (pretest) and one at the end of each semester (posttest). The pretest and posttest themes each semester were written on identical topics. Papers were coded so graders could not ascertain whether any given theme was written as a pretest or as a posttest. Each theme was scored for mechanics, organization, effectiveness of sentences and diction, and for content as well as for overall quality.

i. Cooperative English Expression Tests: Effectiveness of Expression: This portion of the well-known battery published by the Cooperative Test Division of Educational Testing Service was administered to all students in Composition and Literature both as a pretest (at the beginning of the year) and as a posttest (at the end of the year).

The essay examinations were graded by multiple readers after appropriate precautions were taken to guard against halo effects. It was impossible for graders to determine whether individual essay papers were written by students in an experimental or control section. (When essays were scored in terms of letter grades, these grades were converted to numerical equivalents in order to facilitate statistical manipulations.)

Estimates of reliability for these tests and correlations between the tests and the final examination (measuring subject-matter knowledge) are cited in Tables 2 and 3.

Although there is a degree of overlap between the functions measured by the "critical thinking" tests and the final examinations, it is apparent from Table 2 that the two kinds of tests are sufficiently independent to warrant a separate analysis of each.

Comparative scores on tests of synthesis, problem solving and critical thinking of students in experimental and control sections are summarized for courses without pretest measures in Table 4 and for Composition and Literature in Table 5. Scores on essay examinations were computed by averaging the scores assigned by the individual readers. Because of the relatively low inter-grader correlations in Marketing, however, scores differing by more than one letter grade were "arbitrated" rather than averaged.

Even though pretests were not administered in courses other than Composition and Literature, the experimental and control sections were equated on the basis of academic ability (as measured by the ACE). This fact lends confidence to the general conclusion that large group rather than conventional instruction need not (and indeed, generally does not) lessen the ability of students to think critically in the subject matter.

This issue is by no means closed at the present time. Additional efforts will be directed toward evaluation of integrative abilities as a function of method

TABLE 2

CHARACTERISTICS OF CRITICAL THINKING AND SYNTHESIS EXAMINATIONS

Test	Scoring	Average correlation with objective Final Examination	Correlation between graders[1]	Kuder-Richardson #21 Reliability[2]
Critical Thinking in Social Science	Objective	.53		.72
Reasoning and Understanding -Natural Sciences	Objective	.48		.73
Reasoning and Understanding -Biological Sciences	Objective	.38		.68
Marketing Case Study				
Test No. 1	Essay	--- *	.63	
Test No. 2	Essay	--- *	.64	
Test No. 3	Essay	--- **	.54	
Business and Government Case Study	Essay	.00	.94	
Synthesis in Sociology	Essay	.63	.70	
Synthesis in Economics				
Test No. 1	Essay	--- *	.92	
Test No. 2	Essay	.60	.95	
Test No. 3	Essay	.65	.77	
English Themes				
First Semester	Essay	.46	--- ***	
Second Semester	Essay	.35	--- ***	

1. Inter-grader reliability for two readers is reported for all essay tests except Sociology. The correlation in the Case of Sociology is an average of the inter-correlation between three readers.

2. Kuder-Richardson reliabilities are reported for objective examinations.

* Administered prior to the end of the course.

** This test was itself the final examination

*** Reported in Table 3.

TABLE 3

AGREEMENT BETWEEN 2 READERS RESPONSIBLE FOR GRADING THEMES IN COMPOSITION AND LITERATURE

Semester	Subscore	Disparity Between Grade Assignment[1.]			
		1 Grade or Less	1.1 to 1.5 Grades	1.6 to 2 Grades	2.1 Grades and More
First	Mechanics *				
	Organization	63% **	15%	11%	11%
	Sentences and Diction	78	08	11	03
	Content	57	15	19	09
	Overall Grade	71	16	11	02
Second	Mechanics *				
	Organization	82%	10%	08%	00%
	Sentences and Diction	92	04	04	00
	Content	88	07	05	00
	Overall Grade	90	08	02	00

1. Grades were assigned on the usual five-letter continuum.

* "Mechanics" was scored by simply counting grammatical errors. Consequently, a double reading was unnecessary.

** This row is to be read: the readers assigned grades for "organization" with a 1-letter-grade or less differential to 63% of the papers, etc.

TABLE 4

COMPARATIVE SCORES ON TESTS OF PROBLEM SOLVING AND SYNTHESIS

Course	Test	Section	N	S.D.	M	t-ratio
Foundations of Human Behavior	Critical Thinking in Social Science	TV Control	138 25	7.45 7.01	29.10 29.40	0.19
Physiology	Science Reasoning -Bio. Science	TV Control	134 22	5.30 6.93	27.54 26.36	0.75
Economics (TV/LC)[1].	Essay No. 1 (middle of first semester)	TV Control	139 47	15.45 12.08	38.45 44.66	2.49 **
	Essay No. 2 (end of first semester)	TV Control	141 48	11.11 9.79	31.84 37.44	3.09 ***
Economics (LC/TV)[2].	Essay No. 3 (end of second semester)	TV Control	112 41	9.27 8.48	31.83 34.56	1.84
Economics (TV/LC)[1].	Essay No. 3 (end of second semester)	LC Control	90 21	10.92 6.72	31.12 30.38	0.29
Economics (LC/TV)[2].	Essay No. 1 (middle of first semester	LC Control	157 64	11.96 11.14	42.90 46.86	2.12 *
	Essay No. 2 (end of first semester)	LC Control	157 64	9.81 8.38	34.37 33.47	0.64
Physics	Science Reasoning -Nat. Science	LC Control	84 22	6.72 7.55	33.87 33.77	0.06
Introductory Psychology	Science Reasoning -Nat. Science	LC Control	54 30	6.08 6.60	32.65 31.93	0.49
Social Studies	Critical Thinking in Social Science	LC Control	31 30	4.91 6.64	33.55 34.97	0.93
Zoology	Science Reasoning -Bio. Science	LC Control	51 42	6.46 5.91	29.24 29.83	0.45
Sociology	Critical Thinking in Social Science	LC Control	58 30	6.67 7.47	31.81 32.40	0.36
	Synthesis in Sociology	LC Control	58 29	9.96 9.53	66.31 67.83	0.68
Marketing	Case Study No. 1	LC Control	36 25	6.46 7.68	74.69 75.72	0.60
	Case Study No. 2	LC Control	35 24	7.49 8.27	75.57 74.88	0.33
	Case Study No. 3	LC Control	36 26	6.99 6.08	74.31 74.42	0.07
Business and Government	Case Study	LC Control	148 54	49.32 55.77	98.41 98.72	0.04

1. A TV section for the first semester and a large class for the second semester.

2. A large class section for the first semester and a TV section for the second semester.

* $p < .05$ ** $p < .02$ *** $p < .01$

TABLE 5

COMPARATIVE SCORES ON TESTS OF SYNTHESIS IN COMPOSITION AND LITERATURE

Test	Section	N	Pretest S.D.	Pretest M	Posttest S.D.	Posttest M	t-ratio[1]	F-ratio[2]
Effectiveness of Expression[3]	LC	89		59.35		62.39	0.08	
	Control	48		59.27		62.50		
Theme[4] - First Semester								
Mechanics	LC	80	13.02	70.23	12.39	74.25	0.20	
	Control	43	12.30	70.07	13.51	74.63		
Organization	LC	80	8.80	69.45	9.18	74.50		0.65
	Control	43	8.88	70.72	7.66	73.67		
Content	LC	80	7.97	70.44	9.00	74.78	0.63	
	Control	43	7.36	70.35	8.59	73.72		
Effective Sentence and Diction	LC	80	7.99	70.60	6.85	74.39	0.44	
	Control	43	7.73	70.42	8.19	73.77		
Overall Grade	LC	80	8.41	66.59	9.31	72.09		1.06
	Control	43	8.57	67.84	9.74	71.21		
Theme[4] - Second Semester								
Mechanics	LC	70	10.52	72.59	9.93	73.55		0.90
	Control	38	9.60	73.45	10.64	75.04		
Organization	LC	70	5.46	71.50	7.27	71.76		1.02
	Control	38	5.89	69.67	8.70	74.13		
Content	LC	70	7.60	70.30	7.04	72.53	1.05	
	Control	38	6.16	70.34	8.26	74.13		
Effective Sentence and Diction	LC	70	6.74	73.37	6.24	73.73		2.63
	Control	38	7.39	73.08	7.64	75.47		
Overall Grade	LC	70	6.95	68.09	8.02	70.51		1.54
	Control	38	7.10	68.95	8.47	72.82		

1. T-ratio for posttest means computed when pretest means were comparable.
2. Analyses of covariance controlling on pretest were computed when there was a discrepancy in pretest means.
3. Scores reported are "scaled scores." A scaled score of 59.00 corresponds to the 64th percentile; a scaled score of 62.00 corresponds to the 75th percentile.
4. Scores reported are numerical equivalents of letter grades. A score of 65.00 corresponds to a grade of D; a score of 75.00 corresponds to a grade of C, etc.

TABLE 6

COMPARATIVE SCORES ON STEREOTYPE AND MISCONCEPTION TESTS

Course	Section	N	Pretest[1] S.D.	Pretest[1] M	Posttest[2] S.D.	Posttest[2] M	Covariance F-ratio[3]
Social Studies	LC	33	0.48	3.58	0.50	3.78	1.82
	Control	29	0.41	3.46	0.50	3.57	
Business and Government	LC	114	7.90	83.96	7.58	86.73	2.26
	Control	51	7.65	83.24	7.60	88.61	
Introductory Psychology	LC	55	2.70	24.22	2.39	26.16	7.43 *
	Control	28	2.77	23.57	1.67	26.79	

1. Pretest administered at the beginning of the course.
2. Posttest administered at the end of the course.
3. Analysis of covariance comparing posttest results controlling on pretest results.

* $p < .01$.

of instruction in subsequent years. Additional data are particularly needed for a wider sampling of TV courses than are now available.

Problem 3: Comparative performance on measures of course-related attitudes.

Changes in attitudes as a result of instruction were investigated in four courses. A brief description of the evaluative instruments and their statistical characteristics is given below.

Stereotypes in Social Studies - Consists of 23 items, 13 of which are critical (i. e., scored) and 10 of which are distractors (not scored). Every item is a statement like "Dictatorships inevitably go to war." Students are required to indicate the extent of their agreement or disagreement with each item on a 5-point continuum ranging from "1. Completely Agree" to "5. Completely Disagree." Scoring is accomplished by averaging the weights of their responses. The split-half reliability of this measure is 0.48.

Stereotypes in Business and Government - Consists of 30 statements, 24 of which are scored and 6 of which are distractors. An example of statements included in this test is: "The vast majority of business men oppose any kind of government regulation of business." Students are required to indicate the extent of their agreement or disagreement with each statement on a 5-point continuum ranging from "1. Strongly Agree" to "5. Strongly Disagree." A student's score is the sum of the weights of his responses to the 24 critical items. The split-half reliability of this measure is 0.68.

Misconceptions in Psychology - This test consists of 52 common misconceptions similar to "The height of the brow is a good index of intelligence." Students are required to respond to each statement as a true-false item. Since 22 of the items are distractors, the best possible score on this test is 30. The split-half reliability is 0.55.

The three instruments described above are somewhat weak from the standpoint of homogeneity (split-half correlations). Nevertheless, they are of considerable interest because they measure in an area quite apart from that usually included in course examinations. Pretest and posttest administrations of these tests are summarized in Table 6.

The covariance analyses presented in Table 6 were necessitated by inequalities in pretest scores of students in the LC and Control groups. These inequalities occurred in spite of the fact that these groups were equated with respect to academic ability. A significant difference in stereotype score at the end of the semester favoring the control section occurred in Psychology. End-of-the-semester stereotype scores in the other two courses appear to be unaffected by the section assignment of the students.

Problem 4: Relationship between level of academic ability and comparative achievement.

In a sense, the discussion thus far has oversimplified the data. We have been concerned, up to this point, with a gross analysis of achievement (defined in a variety of ways) as a function of method of instruction. All significant differences uncovered have favored control rather than experimental forms of instruction (with one exception in the spring of 1956). But in the majority of instances achievement in experimental and control sections has been demonstrated to be comparable.

It is now appropriate to look further into the data by adding an additional variable to the analysis--i. e., academic ability. It would be quite possible to find that a gross analysis of achievement yields no differences as a function of method of instruction because of a cancellation effect produced by the factor of ability. High ability students, for example, might acquire more in large sections or TV sections whereas low ability students might acquire more in conventional sections. The converse hypothesis might also be tenable. In either case, the interaction between ability and section assignment as a joint determinant of achievement would be obscured by the overall analyses thus far presented.

Basically, then, the inquiries we are making in this section are: Do the high ability students achieve as well when assigned to an experimental section as when assigned to a control section? Similarly, do the low ability students achieve as well in experimental and control sections?

Ability as used here is defined by score on the ACE. Ideally, it would be desirable to maximize the differences between the high and low ability subgroups by utilizing just the tails of the ACE distribution. This is infeasible, however, because of the relatively small sizes of most control sections. Consequently "high ability" was generally defined as an ACE score at or above the fiftieth percentile; "low ability" is defined as an ACE score below the fiftieth percentile. Even this dichotomization at the median necessitated the elimination of several courses from this analysis because the subgroups were too small.

Data are summarized separately for achievement defined as subject-matter knowledge (Table 7), critical thinking and synthesis (Table 8) and acquisition of course-related attitudes (Table 9).

Examination of Table 7 indicates that for courses wherein data were amenable to analysis, level of ability does not interact with section assignment as a joint determinant of acquisition of subject-matter knowledge. In other words, neither high ability students nor low ability students treated as separate subgroups are particularly penalized by assignment to a TV or LC section. The only possible exception to this general conclusion occurred in Composition and

TABLE 7

ACQUISITION OF SUBJECT-MATTER KNOWLEDGE AS A DUAL FUNCTION OF SECTION ASSIGNMENT AND LEVEL OF ABILITY[1].

Course	Sem.[2]	Section	High Ability Subgroup N	S.D.	M	t-ratio	Low Ability Subgroup N	S.D.	M	t-ratio
Economics (TV/LC)	1	TV	78	5.04	36.82	0.76	63	4.99	33.95	0.68
		Control	32	3.94	37.78		16	3.76	34.88	
Economics (LC/TV)	2	TV	85	4.62	36.31	1.11	72	3.40	35.25	1.07
		Control	33	3.78	37.45		31	4.85	34.13	
Composition & Literature	1	LC	95	3.99	36.64	1.48	45	4.82	30.28	0.87
		Control	60	4.45	35.62		24	5.02	30.17	
	2	LC	76	8.96	39.55	2.22*	--	---	---[3]	
		Control	44	5.24	42.43		--	--	---	
Geography	1	LC	151	9.24	75.14	0.41	145	9.62	68.83	0.44
		Control	42	10.45	75.74		32	11.34	69.81	
	2	LC	115	8.86	71.49	0.04	92	9.60	68.17	0.06
		Control	23	9.90	71.78		19	9.92	67.68	
Zoology	1	LC	75	11.89	68.35	0.43	60	11.98	55.80	0.19
		Control	36	10.53	69.31		28	12.69	55.25	
	2	LC	62	14.06	72.84	0.02	--	---	---[3]	
		Control	30	8.00	72.80		--	---	---	
Introductory Psychology	1	LC	54	17.27	103.11	0.14	34	20.39	89.21	0.57
		Control	34	12.48	102.62		19	17.08	92.42	
Mathematics	1	LC	39	12.14	68.33	1.45	38	12.95	50.37	1.05
		Control	35	16.00	63.49		30	11.97	53.63	
Introduction to Business	1	GS	67	12.69	109.96	0.18	84	16.10	97.17	0.41
		Control	70	9.07	109.50		68	13.72	96.68	
	2	GS	44	13.44	115.43	0.24	52	13.29	106.56	0.09
		Control	58	15.63	115.66		46	13.65	106.87	

1. Defined by total score on the ACE. "High Ability" defined as scores at or above the 50th percentile; "Low Ability" defined as scores below the 50th percentile.

2. 1 - First Semester, 1956-1957; 2 - Second Semester, 1956-1957.

3. Groups too small for analysis.

TABLE 8

PERFORMANCE ON TESTS OF CRITICAL THINKING AND SYNTHESIS AS A DUAL FUNCTION OF SECTION ASSIGNMENT AND LEVEL OF ABILITY[1.]

Course	Test	Section	High Ability Subgroup N	S. D.	M	t-ratio	Low Ability Subgroup N	S. D.	M	t-ratio
Economics (TV/LC)	Essay - First Semester	TV	78	10.63	34.67	2.47*	63	10.65	28.33	1.61
		Control	32	8.02	39.31		16	11.77	33.69	
Economics (LC/TV)	Essay - Second Semester	TV	58	9.18	33.62	2.22*	54	8.97	29.91	0.52
		Control	21	6.48	37.81		20	8.97	31.15	
Economics (TV/LC)	Essay - Second Semester	LC	53	9.99	34.30	1.54	--	---	---[2]	
		Control	15	7.14	30.67		--	---	---	
Economics (LC/TV)	Essay - First Semester	LC	85	10.81	34.65	0.71	72	9.33	34.04	1.50
		Control	33	6.61	35.79		31	9.31	31.00	
Zoology	Reasoning - Bio. Sciences	LC	33	4.63	32.15	0.35	18	5.25	23.89	1.28
		Control	28	5.66	31.68		14	4.37	26.14	
Business and Government	Cases for Solution	LC	76	50.94	102.33	0.95	72	47.52	94.28	0.94
		Control	27	52.01	113.48		27	54.36	83.96	
Marketing	Cases for Solution	LC	68	7.34	75.24	0.52	36	7.01	73.61	1.24
		Control	53	6.79	74.57		22	7.20	76.05	
Sociology	Crit. Thkg. - Soc. Sciences	LC	40	5.80	33.25	1.16	--	---	---[2.]	
		Control	21	5.81	35.10		--	---	---	
Psychology	Reasoning - Nat. Sciences	LC	40	6.05	33.38	0.30	--	---	---[2.]	
		Control	24	4.53	33.79		--	----	---	
Composition and Literature	Effectiveness of Expression	LC	66	6.80	64.68	0.93	--	---	---[2]	
		Control	42	6.91	63.40		--	---	---	
	Theme - First Semester	LC	52	8.96	74.58	0.39	28	8.13	67.46	0.62
		Control	29	9.94	73.69		14	6.89	66.07	
	Theme - Second Semester	LC	51	8.46	71.25	1.24	--	---	---[2.]	
		Control	30	8.42	73.70		--	---	---	

1. Level of Ability defined by total score on ACE. Dichotomisation occurred at the 50th percentile.

2. Groups were too small to permit comparisons.

* $p < .05$

TABLE 9

CHANGE IN STEREOTYPES IN BUSINESS AND GOVERNMENT AS A DUAL FUNCTION OF SECTION ASSIGNMENT AND LEVEL OF ABILITY[1.]

Level of Ability	Section	N	Pretest Administration S. D.	M	Posttest Administration S. D.	M	Covariance F-ratio[2.]
High	LC	56	6.75	81.77	6.20	86.48	10.29 *
	Control	21	8.35	84.43	8.03	92.14	
Low	LC	31	6.50	84.52	8.11	84.87	0.06
	Control	18	6.83	81.61	6.62	84.89	

1. Level of ability defined by total score on the ACE. "High Ability" students earned scores at the 60th percentile or higher; "Low Ability" students earned scores at the 40th percentile or lower.

2. Analysis of covariance controlling on pretest score.

* $p < .01$.

Literature wherein high ability students in control sections earned a significantly better mean score than students of similar ability in the LC section at the close of the second semester, 1957. In 1956, however, it was the low ability students in the course who seemed adversely affected by assignment to the LC section.

The general finding that ability and section assignment do not interact to affect subject-matter acquisition is compatible with results cited in the earlier Progress Report.

When the criterion focus changes from subject-matter knowledge to the tests of critical thinking and synthesis (Table 8) the results again indicate the absence of differential effectiveness of TV and LC instruction for high and low ability subgroups except in Economics. In this instance, high ability students profited considerably more from assignment to the control than to the TV section whereas the achievement of low ability students was comparable regardless of section assignment.

Changes in course-related attitudes as a dual function of section assignment and level of ability are reported for Business and Government in Table 9. (The two other courses wherein such attitudes were measured were not of sufficient size to permit dichotomization on the basis of ability.)

The data presented in Table 9 are reported as covariance F-ratios controlling for inequalities in scores on the administration of the criterion as a pretest. It is apparent that the high ability students in the control section profited from the course to a considerably greater extent than the high ability students in the LC section from the standpoint of developing course-related attitudes. The development of these attitudes by low ability students, on the other hand, was relatively unaffected by assignment to the experimental or control sections. It would be unwise to generalize about the development of course related attitudes as an interactive function of ability and section assignment at this time because of the paucity of data. Additional information regarding this problem will be available next year.

In summary, with respect to Problem 4, it is quite apparent that there is as yet no evidence for specific selection of students on the basis of academic ability for assignment to experimental or control sections of most courses when the objectives of the course include acquisition of subject-matter knowledge and/or critical thinking, synthesis and development of attitudes.

Problem 5: Achievement in experimental sections as a function of student attitudes about the medium of instruction.

In order to contribute to an understanding of the factors responsible for achievement in TV and LC sections, it is appropriate to inquire whether students

TABLE 10

SUBJECT-MATTER ACHIEVEMENT AS A FUNCTION OF STUDENTS' ATTITUDES ABOUT RECEIVING INSTRUCTION IN AN EXPERIMENTAL SECTION

Course	Attitudinal Subgroup[1.]	Exam. Scores N	S.D.	M	Covariance t-ratio	F-ratio[2.]
Foundations of Human Behavior - 1st Sem.	Fav. to TV (3.5)	33	16.88	113.48	2.21*	
	Unfav. to TV (5.4)	22	13.38	104.73		
Foundations of Human Behavior - 2nd Sem.	Fav. to TV (3.9)	26	14.60	150.65		0.22
	Unfav. to TV (5.7)	28	20.19	130.14		
Air Science - 1st Sem.	Fav. to TV (4.9)	26	11.12	91.73	0.08	
	Unfav. to TV (6.0)	41	21.44	92.04		
Air Science - 2nd Sem.	Slightly Unfav. to TV (5.9)	30	10.72	67.67	0.17	
	Very Unfav. to TV (6.5)	23	13.45	68.61		
Physiology - 1st Sem.	Fav. to TV (4.9)	21	8.95	63.00	0.75	
	Unfav. to TV (6.8)	31	7.06	61.26		
Physiology - 2nd Sem.	Neutral (5.0)	19	7.07	76.79	0.75	
	Unfav. to TV (6.8)	26	8.54	75.00		
Economics (TV/LC)	Fav. to TV (4.8)	23	3.80	36.83		0.09
	Unfav. to TV (6.7)	27	4.58	33.85		
Economics (LC/TV)	Unfav. to TV (6.0)	20	3.87	37.00		0.42
	Very Unfav. to TV (7.0)	22	5.27	34.09		
Economics (TV/LC)	Unfav. to LC (5.5)	25	5.37	38.72		0.02
	Very Unfav. to LC (6.4)	26	6.09	34.19		
Economics (LC/TV)	Fav. to LC (4.9)	24	4.82	34.46		0.21
	Unfav. to LC (6.5)	20	4.83	35.25		
Business and Government	Unfav. to LC (5.5)	24	11.14	64.54	2.16*	
	Very Unfav. to LC (6.3)	31	26.26	51.94		
Chemistry - 1st Sem.	Unfav. to LC (5.8)	23	31.72	119.56		0.27
	Very Unfav. to LC (6.7)	29	30.26	111.41		
Composition and Literature - 1st Sem.	Neutral (5.0)	25	19.60	33.00		1.64
	Unfav. to LC (6.3)	32	22.80	35.72		
Composition and Literature - 2nd Sem.	Neutral (5.0)	21	6.62	38.14		0.01
	Unfav. to LC (6.1)	26	5.72	42.69		
Psychology - 1st Sem.	Fav. to LC (4.8)	20	15.65	103.98	1.02	
	Unfav. to LC (6.0)	32	20.19	98.44		
Psychology - 2nd Sem.	Fav. to LC (4.8)	18	11.84	110.67		1.06
	Unfav. to LC (6.0)	23	15.12	105.44		
Zoology - 1st Sem.	Fav. to LC (4.8)	26	10.15	66.96		4.17*
	Unfav. to LC (6.1)	25	13.94	61.44		
Zoology - 2nd Sem.	Fav. to LC (4.8)	22	10.97	64.95	0.61	
	Unfav. to LC (6.1)	21	14.53	62.52		

1. Criterion of attitude was a Thurstone-type scale requiring students to evaluate TV (or LC) instruction as compared to conventional instruction. 5.0 is the neutral point on this scale; "scores" below 5.0 favor TV over conventional instruction. Cutting "scores" for each subgroup are indicated in parentheses.

2. Analysis of covariance controlling on ACE score used instead of t-ratio whenever there was a sizeable discrepancy in mean ACE score of the attitudinal subgroups being compared.

* $p < .05$.

who liked TV or LC instruction profited more from the course than students who disliked the experimental modes of instruction. The criteria of "liking" or "disliking" instruction in TV or LC sections were two Thurstone-type attitude scales requiring the students to evaluate the experimental modes of instruction against the standard of conventional instruction. These scales are described subsequently in greater detail. It is sufficient to indicate at this point that a "score" of 5.0 on these scales represents a neutral position: favoring neither TV (LC) or conventional instruction. Scores below 5.0 favor experimental over conventional instruction whereas scores above 5.0 favor conventional instruction over TV (LC) instruction.

Students within experimental sections were categorized on the basis of scores on these attitude scales. Mean scores on the criterion of subject-matter achievement (the final examination) were compared for these subgroups. The resultant data are summarized in Table 10.

It is important to note that direct comparisons between average achievement scores of the attitudinal subgroups by means of t-ratios were obviated in a number of courses because of an ability differential between the subgroups. Whenever this occurred, the achievement data were analyzed by covariances (rather than t-ratios) controlling on ACE scores.

The prevailing tendency in Table 10 is for students who favor TV or LC instruction over conventional instruction to earn slightly higher examination scores than students who favor conventional classes (even when ability differentials are controlled). This tendency does not, however, constitute a strong contraindication for TV and LC instruction because mean differences in achievement were statistically significant in only three of the courses wherein comparisons were made. Concern with student attitudes about being assigned to an experimental section is therefore more vital as a matter of public relations than of academic achievement.

SUMMARY OF FINDINGS: ACHIEVEMENT

1. Achievement defined as acquisition of subject-matter knowledge:

a. In general, students in TV sections perform about as well as students in control sections. Exceptions to this generalization are apparent during the second semester of full year courses, suggesting the possibility of motivational decline as the novelty of TV instruction is dissipated. This possibility will be explored further during the forthcoming year.

b. Achievement in LC and control sections is comparable.

c. There is a tentative indication that for at least one course (Economics) achievement in the LC section may be superior to achievement in the TV section.

This is an inference rather than an experimental finding and should be taken as suggestive for further research rather than as an empirical conclusion.

d. Students in sections of Introduction to Business taught by graduate assistants achieve to the same extent as students in control sections taught by regular faculty members. In another course (Geology) however, achievement in GS sections was inferior to achievement in the control section.

Data appropriate to the reconciliation of the above noted differences between these two courses are not yet available.

2. Achievement defined as critical thinking, problem-solving and synthesis:

a. Measures of these abilities were adversely affected by assignment to the LC section in only one course (Economics) of the eight wherein this problem was investigated. In general, LC instruction compares favorably with conventional instruction in this regard.

b. This problem was investigated in three TV courses. Here again, the experimental mode of instruction was inferior to conventional instruction in Economics, but not in either of the other courses.

3. Achievement defined as development of course-related attitudes:

a. Course-related attitudes are not as well developed in the large sections as in the control sections of certain courses. The lessened effectiveness of LC instruction is clearly apparent in Introductory Psychology. It is apparent also for high ability students (but not for low ability students) in Business and Government. The only course of the three investigated wherein course-related attitudes were developed equally in the LC and C section was Social Studies. (This problem was not investigated in TV courses.)

4. Factors influencing achievement:

a. Level of ability generally does not interact with section assignment as a dual determinant of achievement. There seems to be no justification for selecting students for assignment to TV, LC or GS sections (rather than to conventional sections) on the basis of academic ability.

b. Student attitudes about TV or LC instruction are relatively minor determinants of their achievement in most courses. Apparently motivation from a variety of sources (e. g., desire to earn a good grade, please the instructor, etc.) is generally sufficient to overcome any negative reactions students may have to large-group instruction.

Section IV. Student Attitude About Course and Instructor

The focus in this chapter is changed from concern with comparative achievement in experimental and control sections to concern with certain student attitudes as a function of instructional procedure.

Two evaluative criteria were employed for this sequence of studies: students' ratings of the course (the C-Scale) and students' ratings of the instructor (the I-Scale). The C-Scale is a Thurstone-type attitude scale based upon a nine-point continuum with 5.0 as the neutral point. "Scores" below 5.0 are favorable (i.e., the course is rated as better than average) whereas scores above 5.0 are unfavorable. The corrected split-half reliability of this scale is 0.92.

The I-Scale requires students to rate their instructor on each of twenty-four items of teaching effectiveness. "Scores" below 5.0 are favorable (i.e., the instructor is better than average), whereas scores above 5.0 are unfavorable. The corrected split-half reliability of this scale is 0.91.

It is desirable to camouflage the identity of specific courses and instructors when discussing attitudinal data of this type for rather obvious reasons. Consequently, the ensuing data are presented for courses designated by code letters rather than by titles. The order in which courses are hereafter listed differs from the sequence of listing in previous sections.

Problem 6: Student attitudes toward the course as a function of section assignment.

A summary of results obtained from administration of the C-Scale is presented in Table 11. This table indicates whether the experimental section of each course was a TV, LC or GS section and lists the standard deviations and means of C-Scale scores in the experimental and control sections of each course. The differences between mean scores in the experimental and control sections of each course are evaluated for significance by t-ratios.

The data in Table 11 exhibit a trend toward slightly more favorable course ratings in control sections than in experimental sections of most courses. This trend is statistically significant, however, only in courses C, I, and S included in the TV and LC phases of the Study and course X from the GS phase. It is interesting to note that courses C, I, and S were all science courses wherein the experimental section was quite sizable (between 150 and 200 students). This suggests that students in the control sections of science courses rate the course more favorably than students in extremely large sections of these courses.

TABLE 11

SUMMARY OF C-SCALE[1.] RATINGS IN EXPERIMENTAL AND CONTROL SECTIONS

Course	Type[2.]	Experimental Section		Control Section		t-ratio
		S. D.	Mean[3.]	S. D.	Mean[3.]	
A	TV	1.12	3.74	1.00	3.52	0.92
B	TV	0.60	2.87	1.00	3.20	2.36*
C	TV	1.03	4.18	0.93	3.37	4.05***
D	TV	1.20	4.05	1.18	3.91	0.47
G	LC	0.82	3.43	0.96	3.40	0.01
H	LC	1.17	4.40	0.95	3.88	1.73
I	LC	1.17	4.98	1.41	4.37	2.10*
J	LC	0.95	3.41	0.91	3.17	1.50
K	LC	1.16	4.62	1.32	4.54	0.27
L	LC	0.85	3.61	0.69	3.43	0.64
M	LC	0.67	2.88	0.48	3.03	0.79
N	LC	0.96	3.59	0.85	3.45	1.07
O	LC	0.85	3.92	0.97	3.79	0.76
P	LC	1.03	4.19	0.99	4.10	0.42
Q	LC	0.96	3.58	0.78	3.32	1.53
R	LC	1.08	3.87	1.05	4.11	0.96
S	LC	1.12	4.15	0.99	3.68	2.77**
T	LC	1.00	3.74	1.34	4.36	2.21*
U	LC	1.23	4.39	1.18	5.67	3.93***
V	LC	1.33	4.75	1.28	4.48	0.71
W	LC	1.17	4.18	1.01	4.02	0.61
X	GS	0.96	3.70	0.72	3.18	5.20***
Y	GS	0.90	3.58	0.88	3.38	1.05

1. Ratings of the course. Administered at the end of the second semester, 1956-1957 in courses U, V and W. Administered at the end of the first semester, 1956-1957 in all other courses.

2. Type of experimental section: i.e., whether TV, LC or GS.

3. Scores below 5.00 are favorable (i.e., the course is better than average); scores above 5.00 are unfavorable.

* $p < .05$ ** $p < .01$ *** $p < .001$

Furthermore, students appear to react more favorably to a course when it is taught by a regular faculty member than when it is taught by a graduate assistant (particularly in course X).

It is important to note that students' reactions to a number of courses were significantly more favorable in the experimental section than in the control section. Course B, for example, was given significantly better ratings by students in the TV section than in the control section. It is likely that this finding resulted from the fact that the instructor capitalized upon the dramatic potential of television for demonstrations to a maximum degree. Courses T and U were similar in content and organization and in both instances the students in the large section reacted more favorably to the courses than students in the control section.

It is apparent, then, that blanket generalizations about student attitudes toward the course as a function of method of instruction are not justified. Student attitudes are undoubtedly a function not only of class size but also of the specific course content and the ability of the instructor to teach to classes of various sizes. Although the presumed advantage of small sections is that they permit a greater degree of student participation and discussion, this need not always be a real advantage from the student point of view (e. g., courses T and U). Similarly, although a presumed disadvantage of TV instruction is the lack of discussion and interchange between student and instructor, it was possible to compensate for this in Course B to such an extent that students preferred the course as given on television to the course as given conventionally.

Problem 7: Student motivation and interest as a function of section assignment.

One frequently encounters objections to large class teaching procedures based upon the belief that students in large sections cannot be as well motivated as students in smaller classes. Large classes are often accused of diminishing student interest and of inhibiting the ability of instructors to whet students' appetites for further contacts with the subject-matter area.

The C-Scale contains several items which specifically concern the matter of student motivation and interest. Five of these items (with which students were asked either to "agree" or "disagree") are:

1. As a result of this course, I have been stimulated to do a good deal of additional reading in the subject matter (aside from class assignments).

2. I frequently looked for an excuse to miss one of these classes.

3. Even if I have the chance in the future, I will avoid having anything further to do with this subject.

4. This course did not whet my interest in the subject matter.

5. This class is responsible for making me consider a vocation in this subject-area.

The percentage of students within the experimental and control sections of TV and LC courses agreeing with each of these statements is reported in Table 12. T-ratios are reported for significantly different percentages.

The results cited in Table 12 were typically obtained at the end of the first semester of full year courses. Whether or not motivation is diminished as a result of assignment to an experimental section for a full year remains an unanswered issue. For the first semester, however, it is apparent that student motivation and interest is very little diminished by attendance in a TV or LC section. In course U student interest as measured by all five items was greater in the experimental section than in the control section!

Problem 8: Student ratings of the instructor as a function of section assignment.

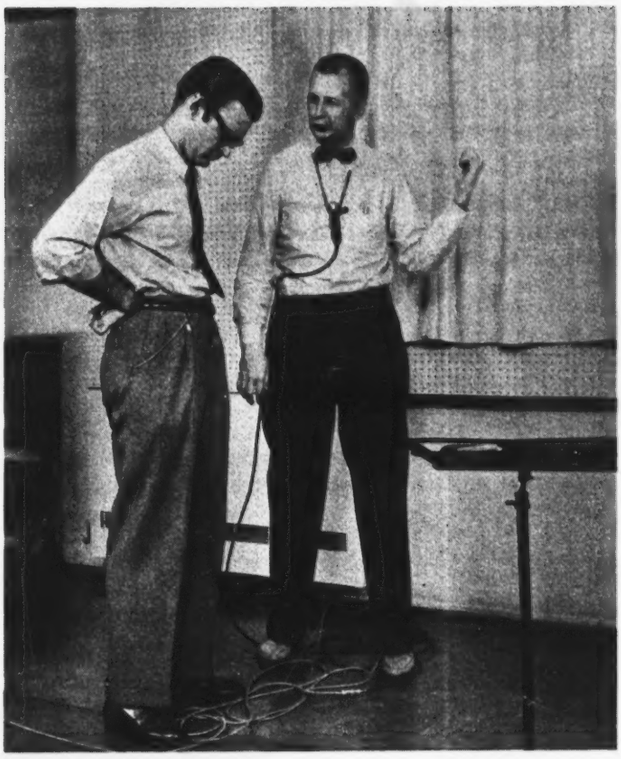
Group data summarizing mean I-Scale "scores" in experimental and control sections along with appropriate t-ratios are presented in Table 13.

There is a pronounced tendency for TV and LC instructors in general to be rated more favorably by students in their control section than by students in their experimental section. This generalization is, however, subject to exception. The most outstanding exception occurred in course T wherein the students in the LC section judged the instructor to be more effective than students in the control section. In a number of other courses, ratings of instructor effectiveness given by students in the experimental and control sections were comparable.

Problem 9: Effect of instructional procedure upon specific criteria of teaching effectiveness.

Attention is here directed to another of the so-called "intangible" benefits presumed to be inherent in small-class instruction. Many teachers express the feeling that they are better able to pace presentations, to maintain student interest, to encourage initiative, etc., in small classes than in large classes. Consequently, the following critical items were extracted from the I-Scale for detailed study:

Item 6: Instructor gives well organized lectures.



Prof. David W. Bergstrom consults with production director prior to Zoology presentation.

TV camera focuses on illumination box as Captain Frederick R. Knarr teaches Air Science.

TABLE 12

RESPONSES TO "MOTIVATIONAL ITEMS" FROM C-SCALE IN EXPERIMENTAL AND CONTROL SECTIONS

Course	Type	N[1]		ITEM RESPONSES													
				Stimulated to do outside reading			Looked for excuse to miss class			Will avoid further contact with subject			Course did not whet interest			Considering vocation in the area		
		Exp.	C.	%Exp.[2]	%C.[3]	t[4]	%Exp.[2]	%C.[3]	t[4]	%Exp.[2]	%C.[3]	t[4]	%Exp.[2]	%C.[3]	t[4]	%Exp.[2]	%C.[3]	t[4]
A	TV	139	32	27	38		07	00	3.30***	10	09		25	28		46	53	
B	TV	167	37	30	27		04	11		05	08		10	14		37	11	4.92***
C	TV	169	41	08	17		16	05	2.44*	22	12		30	17		10	27	2.36*
D	TV	135	58	09	19		13	07		23	19		19	28		12	14	
G	LC	127	64	20	13		11	03	2.29*	09	13		20	17		15	11	
H	LC	77	29	08	14		18	21		14	14		46	35		04	00	
I	LC	135	24	04	13		40	25		41	25		58	46		10	04	
L	LC	38	23	13	13		13	04		11	13		21	19		21	17	
M	LC	33	17	76	65		03	06		00	00		12	06		18	35	
N	LC	103	21	13	14		02	05		09	00	3.20***	17	10		07	19	
O	LC	47	54	06	02		04	14		23	18		30	37		17	13	
Q	LC	86	48	07	15		10	11		10	04		26	13		21	19	
R	LC	70	54	24	35		03	13	2.00*	13	26		31	33		03	02	
S	LC	122	60	07	10		19	07	2.47*	36	23		33	27		06	17	2.07*
T	LC	51	29	45	59		06	52	4.67***	08	14		25	35		18	17	
U	LC	43	23	40	04	3.36***	16	44	2.38*	09	35	2.39*	33	78	4.01***	26	04	2.81**
W	LC	85	28	07	21		22	21		26	21		34	46		14	25	

1. N is number of cases in the experimental and control groups.
2. Percent in experimental group agreeing with the item.
3. Percent in control group agreeing with the item.
4. T-ratios between percentages reported only when satistically significant.

* $p < .05$ ** $p < .01$ *** $p < .001$

TABLE 13

SUMMARY OF I-SCALE[1.] RATINGS IN EXPERIMENTAL AND CONTROL SECTIONS

Course	Type	Experimental Section S. D.	Experimental Section Mean[2.]	Control Section S. D.	Control Section Mean[2.]	t-ratio
A	TV	1.23	3.90	0.97	3.48	1.62
B	TV	0.94	2.28	0.99	2.28	0.00
C	TV	1.17	4.56	1.19	3.44	4.67***
D	TV	1.25	3.84	1.03	3.10	3.52***
G	LC	0.74	1.90	0.71	1.94	0.06
H	LC	1.26	3.97	1.16	3.44	1.77
I	LC	1.57	4.03	1.25	3.11	2.49*
J	LC	1.09	2.46	0.73	2.30	0.36
K	LC	1.58	4.22	1.65	4.30	0.19
L	LC	1.33	3.20	0.79	2.72	1.30
M	LC	1.10	2.65	1.05	2.66	0.00
N	LC	1.02	2.82	1.14	2.71	0.79
O	LC	1.30	3.28	1.09	3.43	0.81
P	LC	0.94	4.50	1.18	4.46	0.17
Q	LC	1.13	4.27	1.10	3.66	2.90**
R	LC	1.16	3.74	0.95	3.20	1.96*
S	LC	1.19	3.73	1.21	3.50	1.15
T	LC	1.03	3.41	1.29	4.29	3.09***
U	LC	1.17	4.53	1.22	4.96	1.31
V	LC	0.86	4.30	1.36	3.98	1.08
W	LC	1.21	4.34	1.22	4.29	0.14
X	GS	0.95	3.64	1.11	3.03	4.69***
Y	GS	1.01	3.30	0.92	2.84	2.00*

1. Ratings of the instructor. Generally administered at the end of the first semester.

2. The lower the score, the more favorable is the rating given the instructor.

* $p < .05$ ** $p < .01$ *** $p < .001$

TABLE 14

RESPONSES TO SOME SPECIFIC ITEMS IN THE I-SCALE

Course[1.]	ITEM RESPONSES											
	Item #6[2.]			Item #7[2.]			Item #8[2.]			Item #9[2.]		
	%E	%C	t[3.]	%E	%C	t[3.]	%E	%C	t[3.]	%E	%C	t[3.]
A	74	66		79	84		65	74		61	69	
B	94	86		89	87		95	100	2.94**	91	92	
C	27	31		52	77	3.29**	94	98		31	50	2.22
D	74	91	3.18**	77	88	1.96*	61	88	4.50**	66	74	
G	99	97		99	97		100	96		96	97	
H	73	72		61	72		84	96	2.16*	47	65	
I	68	83		63	86	3.00**	73	79		68	79	
L	71	68		76	86		85	87		60	77	
M	81	71		84	71		88	88		78	76	
N	99	100		96	95		98	95		93	91	
O	86	65	2.55*	92	74	2.51*	86	74		79	61	2.02
Q	25	40		34	49		58	51		26	38	
R	52	51		63	56		85	100	3.44**	46	52	
S	92	95		70	78		57	58		75	82	
T	45	21	2.34*	60	42		64	52		55	45	
U	11	08		24	13		56	47		23	13	
W	51	56		61	82	2.34*	53	71		52	60	
X	35	57	3.66**	58	79	3.74**	68	82	2.64**	47	65	2.98
Y	84	87		83	78		63	87	3.42**	77	83	

1. The experimental sections of course A-D were TV sections; G-W were LC sections; X-Y were
2. Percentages of favorable ratings on each characteristic are summarized separately for the
3. T-ratios between percentages are reported only when statistically significant.

* $p < .05$ ** $p < .01$

Item 7: Instructor makes major points clear.

Item 8: Instructor is enthusiastic in his teaching.

Item 9: Instructor unifies the subject in his lectures.

Item 14: Instructor makes sure students understand difficult points.

Item 15: Instructor paces lecture properly in speed and content to student's comprehension.

Item 16: Instructor holds the interest of more than just the brightest students.

Item 19: Instructor teaches so that student's out-of-class interest is aroused.

Item 24: Instructor encourages initiative on the part of the students.

TABLE 14 - (CONTINUED)

	ITEM RESPONSES														
	Item #14[2.]			Item #15[2.]			Item #16[2.]			Item #19[2.]			Item #24[2.]		
	%E	%C	t[3.]	%E	%C	t[3.]	%E	%C	t[3.]	%E	%C	t[3.]	%E	%C	t[3.]
A	45	72	2.88**	57	66		52	66		51	62		37	52	
B	75	87		75	92	3.04**	92	95		77	71		69	79	
C	44	74	3.83**	35	65	3.62**	38	86	7.30**	27	55	3.30**	34	72	4.81**
D	50	97	9.63**	46	83	5.67**	39	72	4.55**	26	45	2.52*	22	50	3.74**
G	96	97		97	97		97	98		74	72		75	81	
H	28	38		28	38		35	51		25	28		24	27	
I	32	73	4.47**	35	55	1.98*	34	48		17	34		21	52	3.13**
L	63	72		34	54		63	91	2.82**	32	50		63	64	
M	75	58		75	58		66	76		75	76		75	71	
N	52	51		74	91		86	95		55	76	1.99*	61	76	
O	74	61		66	58		81	63	2.07*	46	26	2.13*	72	63	
Q	22	30		35	54	1.97*	46	52		34	24		31	35	
R	62	56		51	63		63	48		40	48		63	70	
S	41	57	2.04*	45	58		55	71	2.15*	27	38		32	35	
T	47	21	2.52*	55	39		55	17	3.85**	41	28		66	52	
U	42	18	2.18*	51	43		23	13		32	04	3.41**	40	31	
W	42	57		38	36		29	28		11	24		21	21	
X	71	81		54	75	3.62**	63	76	2.30*	36	48	1.98*	42	69	4.56**
Y	71	81		71	76		74	84		48	62		54	64	

GS sections.

experimental group (%E) and the control group (%C).

The students were required to rate their teacher with respect to every item from A ("outstanding with reference to the item") to E ("among the very worst teachers with respect to the item"). The percentages of A and B ratings given each instructor on the critical items by students in his experimental and control sections are summarized in Table 14.

Some instructors participating in the Study suspected that large-group instruction (including TV and LC) compelled them to adhere to a better organization of material in their presentations. This suspicion is somewhat substantiated by students' responses to Item 6. In only one course (D) did the control section students feel that their instructor did a better job of organization than did the students in the experimental section. In all other TV and LC courses the percentages of favorable responses to this item were either significantly higher in the experimental section than in the control section or about the same in the two sections. In a number of courses the data indicated superior organization in the experimental section, even though the difference between percentages were not statistically significant. In summary then, there is no evidence that organization of presentations suffers as a function of increased class size (with the exception of course D). Rather, available evidence supports the con-

clusion that organization is as good in large classes as in smaller ones and even superior in some of the large sections.

There was some tendency on the remaining items for control group students to rate their instructors higher than did experimental groups. This is particularly true in the case of Items 14 ("makes sure students understand difficult points"), 15 ("paces lecture properly in speed and content"), 16 ("holds interest of more than just the brightest students") and 19 ("teaches so that out-of-class interest is aroused"). This tendency toward more favorable ratings in the control section is, however, not overwhelming. The instructors in the majority of courses received comparable ratings from their sections and a few instructors were rated somewhat more favorably by students in experimental sections.

It is apparent then, that some of the specific "intangible" benefits often associated with a low student-instructor ratio need not be sacrificed as a result of large group instruction. Organization, clarity and pacing of presentations as well as stimulation of student interest are all important aspects of effective teaching. These criteria of effectiveness were as often as not met as satisfactorily in the experimental section as in the control section.

The data in Table 14 do, however, indicate that on the factors under consideration regular faculty members are rated higher than are graduate student assistants (courses X and Y).

SUMMARY: STUDENT ATTITUDES ABOUT THE COURSE AND THE INSTRUCTOR

1. Blanket generalizations about student attitudes regarding the worth of a course as a function of class size are not justified. Other factors, including course content and the ability of the instructor to handle larger groups of students interact with class size to affect these attitudes.

2. Student motivation and interest in the subject-matter is not significantly diminished when the course is presented on television or in large classes.

3. There is a pronounced tendency for instructors to be rated as more effective when they teach conventional or small sections than when they teach TV or large classes. Again, however, this generalization does not hold for all instructors. Some teachers are able to teach large groups as effectively as smaller ones.

4. Some of the specific "intangible" benefits often associated with a low student-instructor ratio need not be sacrificed as a result of large group instruction. These intangibles are, however, achieved somewhat more satisfactorily by faculty members than by graduate student assistants.

Section V. Student Attitudes About Televised and Large Class Instruction Per Se

The effect of student attitudes upon achievement was discussed in an earlier section of this report. This effect was demonstrated to be minimal. The matter of attitudes remains, however, as a highly important morale problem.

Three attitude scales served as evaluative criteria for the ensuing attitudinal studies. All scales were of the Thurstone variety and were based upon a nine-point continuum with 5.0 as the neutral point.

1. TV-Scale - Requires students to evaluate the effectiveness of televised instruction in comparison to conventional (small class instruction). Scores above 5.0 favor conventional instruction over TV instruction. The corrected split-half reliability of the scale is 0.89.

2. LC-Scale - Requires students to evaluate the effectiveness of large class instruction in comparison to conventional instruction. Scores above 5.0 favor conventional instruction over LC instruction. The corrected split-half reliability of the scale is 0.92.

3. TV-LC Scale - Requires students to compare the effectiveness of TV and large class instruction. Scores above 5.0 favor large class instruction over TV instruction. The corrected split-half reliability of the scale is 0.90.

Additional information about student attitudes was extracted from their written comments solicited at the time they completed the attitude scales and from tape-recorded interviews of groups of students enrolled in each of the TV courses.

Problem 10: Student evaluations of TV and LC instruction per se.

The TV and LC scales were administered in all courses at the end of the first semester and readministered in certain courses at the end of the second semester. Both scales required comparisons against the standard of conventional instruction. Group data summarizing the findings are cited in Table 15. The fiducial limits cited in this table permit extension of the mean and interpretation in terms of the "neutral" position of 5.0.

The data exhibited in Table 15 lead to the generalization that as a group students presently assigned to TV and LC sections would prefer assignment to a conventional section. The only exception to this generalization occurred in the case of Course B. This exception indicates that it is possible to teach a TV

TABLE 15

SUMMARY OF STUDENTS' ATTITUDES TOWARD
TV AND LC INSTRUCTION COMPARED TO CONVENTIONAL INSTRUCTION

Course	Scale[1.]	First Semester N	S.D.	M	Fiducial Limits[2.]	Second Semester N	S.D.	M	Fiducial Limits[2.]
A	TV	96	1.10	5.53	± 0.22	76	0.88	5.98	± 0.20
B	TV	155	0.87	4.29	± 0.14	134	0.90	4.78	± 0.16
C	TV	165	0.79	6.08	± 0.12				
D	TV	123	0.97	5.93	± 0.18				
E	TV					101	0.77	6.43	± 0.16
F	LC					86	0.71	5.91	± 0.16
G[3.]	LC	122	0.58	5.75	± 0.10				
H	LC	66	0.58	5.88	± 0.14	44	0.68	5.76	± 0.20
I	LC	131	0.61	6.20	± 0.10	76	0.63	6.28	± 0.14
J	LC	40	0.66	5.74	± 0.22				
K	LC	125	0.74	5.69	± 0.14				
L	LC	27	0.71	5.51	± 0.27				
M	LC	32	0.64	5.90	± 0.22				
N	LC	264	0.77	5.36	± 0.10				
O	LC	64	0.70	5.60	± 0.18				
P	LC	69	0.70	6.04	± 0.16				
Q	LC	83	0.71	5.59	± 0.16				
R	LC	43	0.71	5.43	± 0.22				
S[3.]	LC	120	0.74	5.46	± 0.14				
T[3.]	LC	43	0.78	5.61	± 0.24				
U[3.]	LC					36	0.67	5.67	± 0.22
V[3.]	LC					33	0.64	5.68	± 0.22
W	LC					53	0.88	5.81	± 0.24

1. The TV and LC scales required comparisons of experimental procedures against the criterion of conventional instruction. The neutral point on both scales is 5.00. Scores above 5.00 favor conventional instruction.

2. Fiducial limits of the mean calculated for the .05 level of confidence.

3. One semester courses. Course H offered both semesters.

course in such a way that students actually prefer televised instruction to conventional instruction. As more is learned about teaching large classes effectively this possibility may become a more frequent reality.

Student attitudes about TV and LC instruction in contrast to conventional instruction are reflected in another way by their replies to one of the items included in the attitude battery:

"You may have the option next semester of enrolling in either a TV (LC) section or a conventional section of a particular course. If both sections are taught by the same instructor (whom you like) and are given at desirable hours, which fit in with your schedule, which section will you choose?"

The responses to this item are summarized by course in Table 16.

The data exhibited in Table 16 again indicate that students in general prefer conventional small-class instruction to either of the experimental procedures (when other factors are assumed to be equal). The exception previously noted in the case of Course B is also noted in Table 16 (wherein 79% of the students are recorded as having indicated a preference for enrolling in the TV sections).

An additional finding of considerable interest may also be noted from examination of both Tables 15 and 16. Attitudinal measures were obtained in two of the TV courses at the end of each semester. In both instances the prevailing attitude toward TV at the end of the second semester was less favorable than it was at the end of the first semester. The matter of progressive disenchantment with televisionas a means of instruction is discussed in greater detail in a later section of this report.

Although students generally indicated a preference for small class instruction over TV or large class instruction, the comparison may be a trifle unrealistic in view of the expected increases in University enrollments. The decision in certain courses very likely will involve a choice between TV and large classes rather than between TV (or large classes) on the one hand and small classes on the other. There are a number of a priori arguments supporting the contention that student attitudes about TV instruction in contrast to large class instruction should be more favorable than their attitudes about TV instruction when compared to small-class instruction. One of the courses in the Study (Economics) was scheduled to permit the students to experience both TV and LC instruction in the same subject matter and from the same instructor. After having received a full semester of each kind of instruction, these students completed the TV-LC Scale. The resultant data are reported in Table 17.

When the TV-LC Scale responses are compared with the TV-Scale responses (Tables 15 and 16) it is obvious that students in Economics were equally

TABLE 16

"VERBAL REGISTRATION" IN TV, LC AND CONVENTIONAL SECTIONS
WHEN INSTRUCTOR IS A CONSTANT

Course	Type	Percent Choosing TV (or LC) Section[1.]	
		First Semester	Second Semester
A	TV	44	22
B	TV	79	48
C	TV	16	
D	TV	18	
E	TV		04
F	LC		12
G	LC	18	
H[2.]	LC	12	31
I	LC	15	06
J	LC	10	
K	LC	29	
L	LC	21	
M	LC	09	
N	LC	44	
O	LC	24	
P	LC	12	
Q	LC	31	
R	LC	31	
S	LC	41	
T[2.]	LC	27	
U[2.]	LC		12
V[2.]	LC		30
W	LC		18

1. The remainder of students chose the conventional section.

2. One-semester courses. Course H was offered both semesters.

TABLE 17

STUDENTS' ATTITUDES: TV INSTRUCTION COMPARED TO LARGE CLASS INSTRUCTION

Course	TV - LC Scale				
	N	S.D.	M	Fiducial limits[1.]	"Verbal Registration" in TV Section[4.]
Economics (TV/LC)[2.]	84	1.33	5.77	±0.29	23%
Economics (LC/TV)[3.]	100	0.91	4.48	±0.18	09%

1. Fiducial limits of the mean calculated for the .05 level of confidence.

2. Offered as a TV course during the first semester and a LC course during the second semester.

3. Offered as a LC course during the first semester and a TV course during the second semester.

4. Percent indicating a preference for enrolling in a TV section rather than a LC section.

unfavorable to TV instruction when it was compared to large class instruction as they were when it was compared to small class instruction. Students in this course favored small classes over large classes, and favored large classes over TV classes. Whether or not this pattern of preference holds for students in other courses is as yet undetermined.

Problem 11: Specific strengths and weaknesses of TV and LC instruction.

The attitudinal data thus far presented have dealt with generalities. Even though the prevailing attitude toward the experimental modes of instruction was negative in all courses but one, there were some students in every course who liked TV (or LC) instruction. And many of the students who reacted unfavorably to TV and LC instruction did perceive certain strengths in these procedures. A diagnostic examination of some of these strengths (and weaknesses) should facilitate improvement of large group teaching procedures.

One of the more interesting features of this aspect of the research is that it clearly demonstrated that one man's meat is another's poison. The very features of TV or LC instruction regarded as the most serious deficiencies by some students were regarded by others as major virtues! The ensuing discussion of relative strengths and weaknesses of TV and LC instruction is based upon item analyses of student attitude scale responses, written comments and several tape-recorded interviews.

Students tend to feel that TV and large class instruction requires a higher level of course organization and a more careful job of presentation by the instructor than is generally the case in small classes. Although the limitation put upon classroom discussions by large group teaching procedures is generally regarded as a serious loss, many students commented that they enjoyed the fact that classes were not bogged down by uninteresting or tangential discussions. An additional strength of TV (but not LC) classes was the rather obvious increase in use of visual aids.

On the debit side of the ledger, students are most vociferous about diminished contact with their instructor, particularly in TV courses. Many students claim that the lack of personal recognition leads to diminished motivation for study. Unfortunately, the proctors in the TV viewing rooms have been unsuccessful in compensating for the instructor's absence.

Students in both TV and LC courses object to the inability to raise questions as they occur during the class hour. The untimeliness of questions postponed until special discussion periods is particularly distressing to students in TV courses.

A variety of comments by students in both TV and LC courses concerned ineffective teaching techniques of individual instructors. Poor use of the blackboard, incorrect pacing of presentations, over-use of straight lecture, and lack of organization seem to be criticisms of the instructor which the students then generalize to TV and LC classroom procedures.

Students are somewhat more outspoken in criticism of TV courses than of LC courses. This is probably due, in part, to the novelty of televised classes, and in part to poor communication of the reasons for teaching TV courses. A number of students perceive this as a plot whereby the university expects to cut costs and increase profits at the expense of adequate instruction.

Problem 12: Change in student opinions about TV and LC instruction from beginning to end of the course (or semester).

A four-item multiple-choice opinionnaire was administered to students in some of the experimental sections at the beginning of the year and again at the end of a full semester. The same opinionnaire was readministered also at the end of the second semester in two of the TV courses. The lead statements for each of the items in the original administration are given below. (Verb tense was changed for readministration at the end of the semester.)

1. "Do you think you will learn as much by means of TV (LC) instruction as you would have learned in a conventional (small) class?"

2. "How well do you think this class will hold your attention compared to a conventional (small) class?"

3. "Aside from class meetings, how much personal-individual contact do you feel you will have with this instructor compared to the contact if he were teaching a conventional (small) class?"

4. "How well prepared (reading textbook assignments, studying notes, etc.) do you feel you will be for each class meeting compared to what your preparation would have been for a conventional (small) class?"

The alternatives accompanying each of these four leads were scaled (Thurstone procedure) and demonstrated to be equidistantly spaced. This fact permitted computation of a scale value for the median response to every item. These values are summarized in Table 18.

Table 18 is to be read as follows: The median response to the "learning" item administered at the beginning of the semester indicated that students in Course A believed their learning would be adversely affected by assignment to

TABLE 18

STUDENTS' RESPONSES TO OPINIONNAIRE AT BEGINNING AND END OF THE SEMESTER

Course	Type		ITEM 1. "Learning"		2. "Attention"		3. "Instructor Contact"		4. "Preparation"	
A	TV	Mdn. -Preliminary	5.56		4.48		6.72		5.02	
		Mdn. -End 1st Sem.	5.75		6.07		6.74		6.46	
		Chi Square		15.42**		17.46**		0.86		33.10***
		Mdn. -End 2nd Sem.	6.42		6.50		6.80		6.94	
		Chi Square[1.]		5.84		4.32		0.48		6.00*
B	TV	Mdn. -Preliminary	3.76		3.66		5.66		4.71	
		Mdn. -End 1st Sem.	3.38		3.21		6.54		4.90	
		Chi Square		6.46		4.94		12.36**		5.62
		Mdn. -End 2nd Sem.	4.30		4.18		6.66		5.41	
		Chi Square[1.]		12.86*		14.00**		0.98		8.04*
C	TV	Mdn. -Preliminary	6.76		6.38		6.58		5.70	
		Mdn. -End 1st Sem.	6.84		6.68		6.78		7.00	
		Chi Square		8.30		4.48		4.50		24.66***
D	TV	Mdn. -Preliminary	6.44		5.80		6.52		5.74	
		Mdn. -End 1st Sem.	7.59		6.98		6.88		6.97	
		Chi Square		21.38***		14.16**		10.08*		22.88***
G	LC	Mdn. -Preliminary	6.03		5.10		6.24		5.48	
		Mdn. -End 1st Sem.	5.86		5.56		6.28		6.32	
		Chi Square		5.94		5.82		0.44		8.68*
H	LC	Mdn. -Preliminary	6.35		6.52		5.92		5.45	
		Mdn. -End 1st Sem.	6.58		6.70		6.40		5.50	
		Chi Square		9.96*		8.58		7.10*		4.54
Q	LC	Mdn. -Preliminary	5.50		5.10		6.12		5.19	
		Mdn. -End 1st Sem.	5.68		5.71		5.80		5.21	
		Chi Square		8.02		8.46		2.56		0.10
W	LC	Mdn. -Preliminary	6.03		5.10		6.24		5.48	
		Mdn. -End 1st Sem.	5.86		5.56		6.28		6.32	
		Chi Square		5.94		5.82		0.44		8.68*

1. This computation of Chi Square based upon comparison of end of first semester responses with end of second semester responses.

* $p < .05$ ** $p < .01$ *** $p < .001$

the TV section (5.56). At the end of the first semester they indicated that they had learned even less from the TV class than they had originally anticipated (5.75). At the end of the second semester they indicated that they had learned still less than they had by the end of the first semester, but the difference between responses at the end of each of the semesters was not statistically significant.

Table 18 leads to the following generalizations:

1. Students seem better able to anticipate their end-of-semester opinions in large classes than in TV classes. (Relatively few statistically significant opinion shifts occurred in the large class sections.)

2. The prevailing tendency was for students in TV courses to be disappointed in the realization of their preliminary expectations about televised instruction. They generally expected to learn less from TV instruction than from small class instruction and reported later that they had received even less than they anticipated. A notable exception occurred in Course B wherein students were favorably disposed to begin with, and were not disenchanted by their first semester experiences. They did, however, react less favorably at the end of the second semester than at the end of the first semester.

Once again it is possible to note a more widespread intra-course variability in attitude in the TV sections than in the LC sections. Note particularly the contrast in responses in courses C and D on the one hand and B on the other. It is now appropriate to focus attention upon some of the factors likely to influence student attitudes about the mode of instruction.

Problem 13: The relationship between student attitudes about TV (LC) instruction and their attitude toward their instructors.

It is apparent from student comments that one of the factors contributing most heavily to the success or failure of TV and LC courses is the instructor. The manner in which he makes his presentation, the extent to which he utilizes special facilities (including visual aids and demonstrations), and the degree to which he "comes through to his class" flavor student attitudes about being in a TV or LC section.

The extent of the relationship between student attitudes about the effectiveness of the instructor and their attitudes toward TV and LC classes is evident from the correlations exhibited in Table 19.

All of the statistically significant correlations in Table 19 are positive: i.e., favorable ratings of the instructor are associated with favorable attitudes toward TV and LC instruction. Although relatively low (not significant) correlations were obtained in a number of LC courses, the general trend toward asso-

TABLE 19

CORRELATIONS BETWEEN I-SCALE RESPONSES AND ATTITUDE TOWARD EXPERIMENTAL TYPES OF INSTRUCTION

Course	Type	r
A	TV	.34**
B	TV	.39**
C	TV	.43**
D	TV	.33**
E	TV	.27**
F	LC	.43**
G	LC	.18*
H	LC	.18
I	LC	.38**
J	LC	.00
K	LC	.38**
O	LC	.20
P	LC	.26
Q	LC	.32**
R	LC	.37*
S	LC	.33**
T	LC	.11
U	LC	.21
V	LC	.01
W	LC	.18

* r exceeds 1.96 times standard error of r of .00 ($p < .05$)

** r exceeds 2.58 times standard error of r of .00 ($p < .01$)

ciation of the two variables under consideration is quite evident even though there may be some argument about which is cause and which is effect.

The importance of the instructor as a determinant not only of student attitudes but also of their expressions of subsequent enrollment in TV, and LC sections was demonstrated by replies to the following questionnaire item:

"You may have the option next semester of enrolling in either a TV (large) class section or a conventional (small) class section of a particular course. Suppose the TV (large) section is to be taught by an instructor who has the reputation of being an excellent teacher, whereas you will have to take your chances on instructor assignment in the conventional (small) section. Which section will you choose?"

Replies to this item are summarized in Table 20.

It is obvious that the majority of students are willing to enroll in a large rather than a small section if it means they will be assured of an excellent instructor. A similar conclusion applies also to all TV courses with the exception of D and E. The majority of students enrolled in these classes were so unhappy with their TV experience that even the lure of an excellent instructor was insufficient to interest them in another TV course.

Problem 14: Relationship between academic ability and attitudes about TV (or LC) instruction.

The experimental sections were categorized on the basis of total ACE score. The cutting points were 65th percentile ("high ability") and 35th percentile ("low ability"). Mean scores on the TV and LC scales were computed by ability subgroup and differences were tested for significance. The resultant data are presented in Table 21. (Data are not exhibited for those LC courses wherein the sizes of the ability subgroups were so small as to preclude further analysis.)

The data in Table 21 contain no evidence of a relationship between academic ability and attitude toward the method of instruction. This finding differs slightly from one reported in last year's Progress Report wherein an inverse relationship between ability and attitude was noted in two of the TV courses.

Problem 15: Relationship between student attitudes about TV instruction and the attitudes of the assistant instructors.

Students in some viewing rooms commented that it is difficult to accept TV instruction when they know that their assistant instructor is opposed to it. The assistant instructor was responsible in certain courses for conducting discussion and for acting as a resource person when questions arose during the TV presentations.

TABLE 20

PERCENT OF STUDENTS PREFERRING TV, LC AND CONVENTIONAL SECTIONS WHEN THE INSTRUCTOR IS A CRITICAL VARIABLE

Course	Type	Percent Choosing TV (or LC) Section[1.]	
		First Semester	Second Semester
A	TV	76	63
B	TV	97	92
C	TV	62	
D	TV	43	
E	TV		32
F	LC		75
G	LC	79	
H[2.]	LC	75	91
I	LC	57	63
J	LC	88	
K	LC	81	
L	LC	92	
M	LC	79	
N	LC	84	
O	LC	70	
P	LC	72	
Q	LC	85	
R	LC	85	
S	LC	85	
T[2.]	LC	90	
U[2.]	LC		96
V[2.]	LC		87
W	LC		84

1. The remainder of the students chose the conventional (small) section.

2. One-semester courses. Course H offered both semesters.

TABLE 21

ATTITUDES TOWARD TELEVISED AND LARGE CLASSES AS A FUNCTION OF ACADEMIC ABILITY

Course	Type	Semester[1]	Attitude in High Ability Subgroup[2] N	S. D.	M	Attitude in Low Ability Subgroup[2] N	S. D.	M	t-ratio
A	TV	1	35	0.84	5.71	33	1.05	5.68	0.13
A	TV	2	30	0.65	6.06	25	0.85	5.98	0.38
B	TV	1	45	0.86	4.27	43	0.99	4.48	1.05
B	TV	2	43	1.00	4.74	32	0.94	4.92	0.75
C	TV	1	46	0.85	6.25	47	0.85	6.04	1.16
D	TV	1	50	0.96	5.84	27	0.98	5.88	0.17
E	TV	2	41	0.76	6.38	25	0.68	6.48	0.53
F	LC	2	45	0.72	5.86	24	0.71	5.90	0.22
G	LC	1	44	0.84	5.62	27	0.82	5.73	0.51
K	LC	1	56	0.62	5.79	25	0.76	5.56	1.35
Q	LC	1	48	0.75	5.56	26	0.79	5.51	0.26
S	LC	1	48	0.67	5.49	27	0.77	5.53	0.23

1. Data obtained during the first semester are designated 1; second semester data are designated 2.

2. Ability defined by total ACE score. High Ability students scored above the 65th percentile; low ability students scored below the 35th percentile.

The problem of carry-over from assistant instructor attitudes about TV instruction to student attitudes about TV instruction was investigated by comparing mean TV-Scale scores within each viewing section. The results of this analysis are summarized in Table 22.

The assistant instructors within two of the courses were ranked from most to least favorable toward the idea of instruction by television. This ranking was done by the TV instructor responsible for the course. The analysis of mean "scores" on the TV-Scale by viewing section reveals a degree of parallelism between assistant instructor attitudes and student attitudes. This is apparent in the data obtained at the end of the first semester. Although the attitude of the assistant instructor is by no means the sole determinant of student attitudes (judging from second semester findings) these data reinforce the desirability of selecting assistant instructors who do not oppose televised education. The recorded interviews with groups of students show the students to be very sensitive to the attitude of the assistant instructor toward televised instruction.

Problem 16: Student end-of-the-semester attitudes about TV instruction as a function of their pre-semester wishes regarding section assignment.

All of the four courses taught through TV were offered also as conventional sections and, in the case of Economics, as a large class section. In order to fill the TV sections, however, students were sometimes assigned to the televised class against their wishes.

One of the items included in a preliminary questionnaire administered to students in the TV classes read as follows:

"How do you feel about being assigned to a TV section rather than to a conventional section?"

"A. I like it. I wanted to be in the TV section."
"B. I don't like it. I would rather be in a conventional section."
"C. It doesn't make any difference to me."

TV-Scale "scores" obtained at the end of the semester were analyzed separately for the subgroups that indicated initial satisfaction and dissatisfaction with assignment to the TV section. These results are summarized in Table 23.

It is obvious that preliminary biases about televised instruction persisted even after exposure to TV instruction for a full semester or year.

TABLE 22

STUDENTS' ATTITUDES TOWARD TV INSTRUCTION BY VIEWING SECTION

Course	Viewing Section	Ranking of Monitors by Attitude[1.]	Students' Attitudes[2.]			
			First Semester		Second Semester	
			S. D.	Mean	S. D.	Mean
A	5	1.5	1.06	5.74	0.67	6.70
	1	1.5	1.05	5.47	1.07	5.80
	3	3.0	0.95	5.90	0.56	6.50
	2	4.5	0.82	6.11	0.91	6.66
	4	4.5	0.60	6.45	0.86	6.37
B	3	2.0	1.04	5.94	0.71	6.63
	5	2.0	0.78	6.08	1.02	5.92
	6	2.0	0.99	6.30	0.89	6.70
	2	4.0	0.69	6.34	0.94	6.77
	4	5.5	0.94	6.50	0.83	6.63
	1	5.5	0.90	6.30	0.99	6.07

1. Ranking of monitors from most to least favorable. These ranks were assigned by the TV instructor responsible for the course.

2. Students' attitudes measured by the TV-Scale.

TABLE 23

END-OF-SEMESTER ATTITUDES ABOUT TV CLASSES AS A FUNCTION OF PREREGISTRATION DESIRES REGARDING SECTION ASSIGNMENT

Course	Semester	Wanted to be in TV Section			Wanted to be in Conventional Section			t-ratio
		N	S. D.	M	N	S. D.	M	
Air Science	First	47	0.91	5.23	21	0.79	6.29	4.42***
Air Science	Second	39	0.87	5.71	15	0.68	6.40	3.70***
Foundations of Human Behavior	First	108	0.82	6.19	9	0.93	6.19	—[b.]
Foundations of Human Behavior	Second	94	[illegible]	6.03	7	0.86	5.93	—[b.]
Physiology	First	25	0.76	5.97	68	0.67	6.25	2.35*
Economics (TV/LC)	First	56	1.07	5.96	50	0.93	6.40	3.03***

b. Subgroup too small for further analysis.

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

SUMMARY OF FINDINGS: STUDENT ATTITUDES ABOUT TELEVISED AND LARGE CLASS INSTRUCTION

This section has been concerned with an examination of student attitudes toward TV and LC instruction and with some of the variables which influence their attitudes. The expression of an attitude in numerical terms by means of scaled measurements is necessary for statistical manipulation but it deprives the reader of the underlying flavor of the attitude. A few quotations from students' written comments are sufficient to indicate both the range and the intensity of their feelings.

> "I wish I had known that TV was to be used at Miami before enrollment. Right now I would be attending a different university."

> "TV compels the professor to have an organized outline for each class. This makes the class more interesting and makes it easier to take notes. I concentrate more in the TV class because the notes are given only once. I hate to sit through unnecessary explanations as found in conventional classes. I have signed up for another TV course next year."

> "TV may be all right for high school instruction or some other course in college (I haven't yet taken one for which it would be suitable) but not in a theoretical course like this. I feel that this semester has been a waste of my time and money along with the time of Dr. X and the money of the state."

> "The instructor can make or break a TV course. Perhaps the reason I liked TV so well is because the instructor was well prepared, knows his stuff, and anticipates questions before they arise. I also enjoyed the great number of visual aids."

Although attitudes such as these have not been demonstrated to affect achievement in the course, they are of concern from the standpoint of student morale. The following generalizations concerning student attitudes are based upon the data presented in this section and student comments during tape-recorded interviews.

1. Students assigned to TV or LC sections generally do not like them as well as conventional (small) classes.

2. It is possible to teach a TV course in such a way that students actually prefer it to conventional instruction. This, however, requires a unique combination of instructor, course material, and the full use of the potentialities of television as an instructional medium.

3. Students in at least one course (wherein the problem was investigated) preferred large class instruction to TV instruction, although they tended to prefer small class instruction to either large or TV classes.

4. Students in TV courses tend to become disenchanted with television as a means of instruction during the course of the year. Most students reported that they neither learned as much nor were as attentive during the course as they had originally anticipated. Students in LC courses, however, are better able to anticipate their end-of-the-year reactions than those in TV courses.

5. Attitudes about the means of instruction are much more variable between TV courses than between LC courses. The prevailing attitude toward LC instruction as compared to control instruction is mildly unfavorable. The prevailing attitude toward TV instruction as compared to control instruction ranges from strong enthusiasm to extreme displeasure.

6. The instructor is a major determinant of how students will react to TV and LC instruction. There is a pronounced tendency for students who dislike their instructor to dislike TV (or LC) classes and vice versa.

7. The majority of students would enroll in a TV or LC section (even though they prefer small classes) if it meant that they would be assured of being taught by an excellent instructor.

8. In general, attitudes about TV and LC instruction are independent of level of academic ability. Two exceptions to this generalization were apparent during the spring, 1956 semester wherein an inverse relationship between academic ability and attitude about TV instruction was obtained.

Students and assistant instructor in class viewing room.

From control room to studio where director consults with cameramen before TV presentation.

Section VI. Instructor Attitudes About Large Group Instruction

Problem 17: Instructor reactions to TV and LC teaching.

Every instructor participating in the Study completed a questionnaire concerning the relative strengths and weaknesses of the experimental (TV or LC) procedures from the teacher's point of view. The items in this questionnaire were not scaled and, as a result, instructors' replies were not scorable. This form was designed solely for diagnostic and informational purposes.

The questionnaire was divided into three parts. The first part required five-point ratings (from "extremely satisfactory" to "extremely unsatisfactory") of a number of features associated with an effective teaching environment. These ranged from the adaptability of the TV (or LC) situation for presentation of demonstrations, interviews and panel discussions to items dealing with use of the blackboard and the instructor's feeling of physical as well as psychic comfort while conducting classes.

The second part of the questionnaire required the instructors to compare the experimental teaching environment with conventional classroom environments in regard to the satisfactory realization of certain basic educational objectives (e.g., development of rapport, students' learning of basic concepts, the teacher's impact upon student growth, etc.).

In the third part, the instructors were asked to indicate the relative amount of preparation time required for large and TV classes. It is both convenient and desirable to summarize responses of the TV and LC instructors separately.

A. Televised Classes.

The sampling of instructors who have had experience teaching TV classes was very small. There was, however, a high degree of agreement between the six instructors regarding the relative strengths and weaknesses of television for teaching purposes.

1. The Teaching Environment.

a. The instructors uniformly felt that they had an extremely satisfactory working relationship with the TV staff (directors, engineer and cameramen). This may be largely attributed to the fact that the directors were sympathetic to the needs and requirements of the teachers. Television was regarded as an adjunct to effective teaching rather than as an end in itself. The instructors, too, facilitated the development of a good working relationship by being alert to possible improvements in camera technique and by maintaining an awareness of the limitations of the equipment.

b. TV was judged to be quite satisfactory for the presentation of demonstrations, interviews, etc. This was regarded as a major advantage of TV since it is possible to obtain participants for a single interview or panel discussion who would have been unavailable for numerous appearances before conventional classes. Furthermore, demonstrations which would have been too unwieldy for repetitive use in conventional classes were amenable to presentation over TV.

c. All instructors reported that they felt quite relaxed and confident while making TV presentations. They each, however, experienced an initial feeling of apprehension about being televised.

d. Physical comfort was a serious problem because of the heat generated by the lights. This situation will be remedied somewhat when the new studios are completed.

e. Pacing (covering material at an appropriate rate of speed) was perceived as a problem by the instructors who were on TV for the first time. The two TV teachers who taught on TV prior to this year felt that they were doing a satisfactory job of pacing.

2. Realization of Objectives: TV Compared to Conventional Classes.

a. TV and conventional instruction were adjudged about comparable with respect to the teacher's ability to animate and enliven his presentations, to make an impact upon student attitudes and appreciations in the subject-matter area and to cover the course content completely. Furthermore, the instructors felt that the students learned the basic concepts presented in the course about equally well in TV and in conventional classes.

b. It was in the realization of the less tangible course objectives that the instructors believed TV to be inferior to conventional instruction. Thus they believed student-teacher rapport was diminished in TV sections and that they were better able to really influence students' overall growth and development in conventional classes.

3. Realization of Objectives: TV Compared to Large Classes.

a. All instructors believed that course objectives were realized about as well (or slightly better) in TV sections as in large class sections.

4. Preparation Time for TV Classes:

a. TV presentations require much more of the instructor than do presentations in conventional classes. It takes time to organize materials, develop visual aids, prepare special demonstrations and to consult with the TV staff. In fact, two of the instructors felt that it took so much time that a single TV

course should constitute a full teaching load. The other instructors believed that a TV course was worth load credit equivalent to two or three conventional classes.

It was interesting to note that the instructors did not anticipate less preparation time for the same TV classes taught a second time. They did not feel that the load adjustment should fluctuate because of previous TV presentations of the course.

B. Large Classes

Twenty instructors completed the LC form of the questionnaire.

1. The Teaching Environment:

a. The instructors as a group did not feel that the large class was particularly satisfactory for presentation of panel discussions, interviews or demonstrations.

b. About half of the instructors reported that student attention was unsatisfactory in large classes.

c. Most instructors felt that large classes were unsatisfactory from the standpoint of providing opportunities for students to raise questions and to clarify misunderstandings. This problem is not nearly as serious in "large" classes of 50-60 students as it is in classes of 100 or more students.

d. Aside from the above-noted difficulties large classes were perceived by the instructors as being quite satisfactory with respect to use of the blackboard, instructor's feeling of ease and confidence, and ability to properly pace presentations.

2. Realization of Objectives: Large Classes Compared to Small Classes.

a. Large and small classes were judged to be of about comparable effectiveness with respect to adequacy of content coverage and the extent to which students learn the basic concepts.

b. Small classes were regarded as superior to large classes for the realization of all other course objectives.

3. Preparation Time for Large Classes:

The general consensus regarding load adjustment is that each large class should be credited as two small sections. Furthermore, the instructors felt that the load adjustment should be independent of prior presentations of the course.

Section VII. Supplementary Services and Related Problems

The several and diverse problems and services discussed in this chapter are integral and important parts of the Study, even though space and available data do not permit a more extended presentation.

Television Facilities and Services

Courses are televised in a studio rather than in a classroom. This seems to have some advantages which more than compensate for the audience situation of classroom telecasting. These advantages include greater flexibility and freedom for camera movement and operation, the availability and use of more nearly professional "props", the possibility for at least semi-professional directing, and the fact that the instructor must teach into the camera. This latter results in students in the receiving room perceiving the instructor as teaching to them personally rather than as teaching to a class which they are watching. It is recognized that studio production is more costly than most classroom telecasting, and that the number of courses which can be televised is limited to studio and equipment facilities, but these disadvantages are believed to be more than offset by the superior quality of production and instruction.

So-called "low cost" equipment is utilized at Miami. The total closed circuit equipment cost, including a three vidicon camera chain, a film and slide chain, fourteen 21 and 24 inch commercial receiving sets, and all control equipment, is listed at $34,552.25.

Telecasting personnel, in addition to the instructor, consists of a half-time engineer (full-time for radio-television), two members of the speech department for something over half-time each for supervising and directing, and approximately seven students (radio-television majors). The latter serve as cameramen, control operators and floor directors, working partly for laboratory credit, and, after several weeks of experience, for pay.

The present studio is in a temporary (World War II) building very poorly adapted to telecasting. However, a new radio-television building soon will be under construction, and it is expected that open circuit course telecasting over the University's Channel 14 will be an accomplished fact in the early spring of 1958. The new building will contain a large and a small TV studio and an instructor preparation room, all of which should result in improved instruction. Also, the new building and equipment will make possible off-campus teaching within the range of the station.

Audio-Visual Facilities and Services

Prior to the beginning of the Experimental Study the Audio-Visual Services of Miami University consisted primarily of film and slide rental, projec-

tion, recording, and photographic services. The department was a two man organization supplemented by student help. The full-time personnel now consists of a director and six specialists in the fields of graphics, photography, recording, and instructional material procurement, with students used as projectionists. One of the audio-visual men has been specifically designated as a special consultant to work directly with staff members in securing and producing instructional materials for their classes.

The present Audio-Visual Department occupies two wartime temporary buildings. Plans are completed, however, for an added wing of Gaskill Hall, with one floor of this wing planned especially to house the Audio-Visual Department.

An indication of the growing demands for instructional materials is gained from a study of services rendered during the two fiscal years of 1955-1956 and 1956-1957 and presented in Table 24.

Summer Workshop Activities

All staff members participating in the Study were invited to attend a workshop during the summer of 1956 and again in 1957. Participants were placed on a partial pay status for the two weeks of the workshop. Approximately 80% of the instructors attended either or both workshops. During the summer of 1956, emphasis was placed chiefly upon evaluation and upon a clarification of course objectives, with the time divided about equally between general meetings and individual or departmental study. Emphasis during the summer of 1957 has been upon improving course organization and instructional materials, but with evaluation as an integral part of study. The following represent only a sampling of the activities of the past summer:

1. Two members of the Geography Department developed a series of 33 sketch maps which are to be used for map study, testing, and map problems. These have been duplicated in quantity for class and individual use.

2. A member of the Government Department reorganized his course syllabus in preparation for an experimental class in which the students will work pretty much "on their own" rather than being held for scheduled class attendance.

3. Five members of the English Department worked as a team developing instruments for use in the evaluation of written expression and "sensitivity" to language. This is part of a serious attempt to measure some of the so-called "intangibles" of learning. The group also gave attention to a further clarification of objectives and the improvement of course organization.

4. A psychology professor spent the time developing instructional aids for use in large group teaching of the beginning course in psychology. Many of the materials are for use with slide and overhead projectors, and are now being produced by the Audio-Visual Department for fall use.

TABLE 24

SUMMARY OF AUDIO-VISUAL SERVICES

Item or Service	July 1, 1955, to June 30, 1956		July 1, 1956, to June 30, 1957	
	July-Dec.	Jan. - June	July-Dec.	Jan. - June
Motion Picture projection	296	450	445	471
Other projection	177	482	215	511
Slides produced	360	1828	1119	1676
Vu-Graph Transparencies	0	12	81	102
Photo copy work	0	450	565	1553
Posters, charts, etc.*	7	64	264	138
Offset printing jobs*	0	6	31	47
Photos taken*	339	393	604	648
Photo prints made*	718	1255	1303	1297
Motion Picture footage*	4250	4234	5112	2108
Recordings produced	6	15	75	130

* Data for these items are approximations as tabulations originally included public relations figures and an exact division was not practicable.

5. Three TV instructors used the time to develop "props" for television presentations and for course modifications based upon the past year's experiences and student evaluations of the instruction.

Participating instructors were unanimous in their belief that the opportunity to devote a full two weeks to course and materials improvement free from other duties was exceptionally helpful, and would result in better teaching. Regardless of intention, time is seldom available for such concentrated effort during the academic year. Consultant assistance, also, was found most helpful.

Evaluative Services

Faculty members participating in the Study have made extended use of the ESIP staff and of special consultants in the improvement of their own course evaluative instruments and procedures. An IBM scoring machine, which stood idle during much of the year prior to the beginning of the Study, now is in constant use, and the graphic item counter which was added last year has made it possible for staff members to item analyze their tests. A surprisingly large number of faculty members have learned to operate both the scoring machine and the item counter, and make regular use of them.

Also, the Study has caused participating faculty and departments to further define their course objectives and to put them in written form so that these objectives may be utilized as criteria for test construction. There is general agreement that the result is better course organization and instruction as well as improved evaluation. In addition, considerable effort is being devoted in some courses to finding ways and means of evaluating student growth in those learnings which do not readily lend themselves to objective measurement.

Facilities for Large Group Instruction

Classrooms at Miami University, with a few exceptions, have been planned for small group instruction. At the present time there are several good "lecture" rooms, but no one room planned specifically to accommodate large groups using a case or problem approach to teaching. A number of rooms designed for this latter purpose are, however, being included in the new Business Administration building for which contracts have been let. Faculty members engaged in a case or problem approach to large group teaching are in agreement that the lack of adequate facilities for such teaching constitutes an almost insurmountable handicap.

Televised teaching also is adversely affected by the lack of rooms planned for TV reception. The present room arrangement, with one side largely glass, and with bright and exposed florescent lighting in the ceiling makes it extremely difficult to control set glare. When rooms are partially darkened to control glare, the students have difficulty in seeing outlines or in taking notes. Also, this darkened condition, combined with the absence of notetaking, is quite conducive to sleep on "drowsy" afternoons.

Costs of Large Group Instruction

Student credit hour costs are subject to so many variables that it becomes exceedingly difficult to arrive at meaningful figures without, at the same time, presenting complete computational data for each course. A senior professor may receive double the pay of a new instructor for teaching a section of 30 students in a given course. A laboratory section conducted by an associate professor is much more expensive than one conducted by a graduate assistant. A televised course for 250 students utilizing 150,000 dollars worth of equipment and a professional studio crew may be prohibitive in cost, while the same course taught with 30,000 dollars in equipment and a student crew with semi-professional direction may be economically sound. In the light of all these factors, the following information is presented with considerable misgivings.

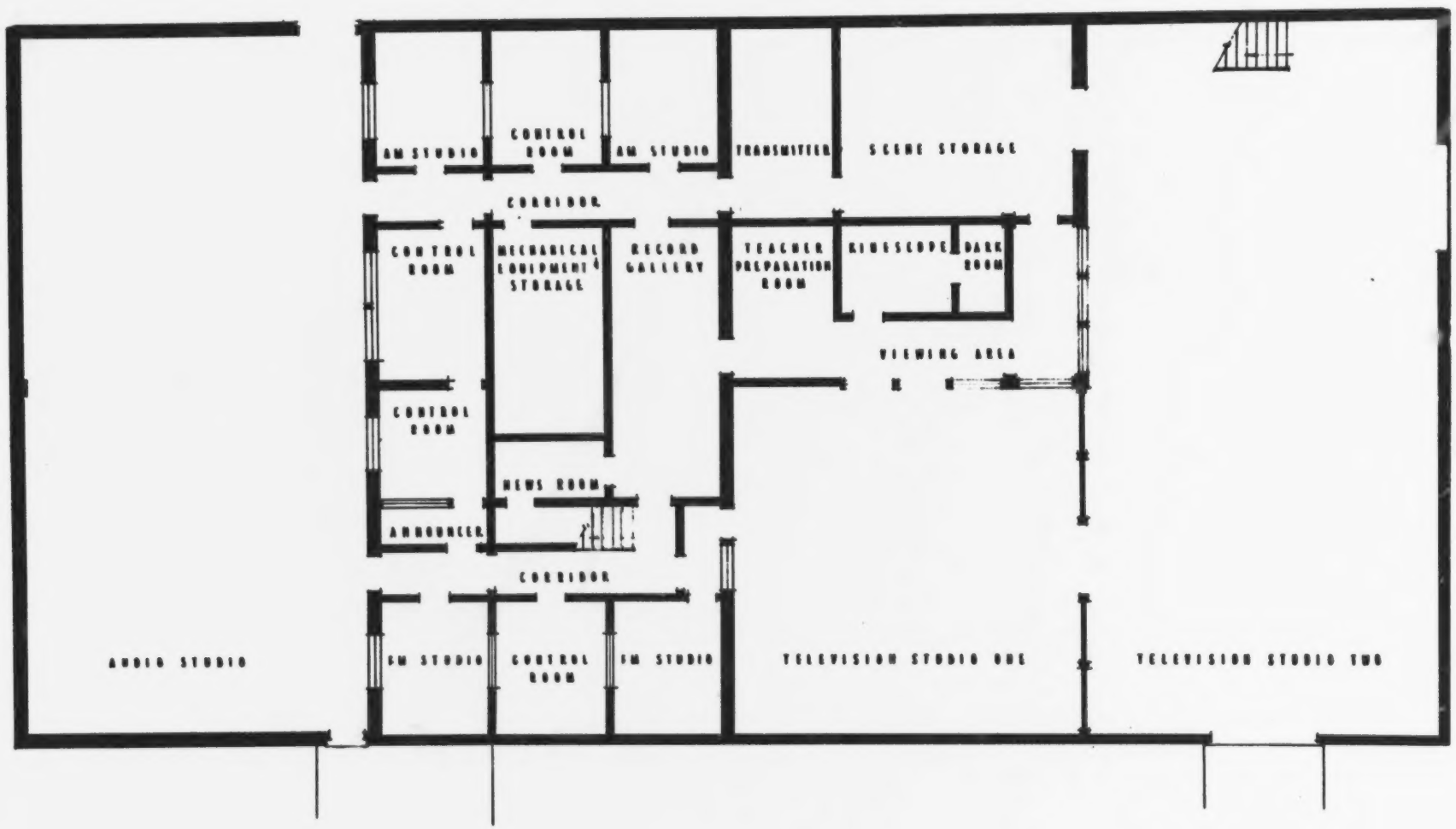
The cost per student credit hour for televised courses was approximately $12.90. Course enrollments ranged from 139 to 206 with an average of 180. The cost per student credit hour for control sections of these classes averaging 38 students each approximated $7.50.

Whether large classes are financially economical or not depends upon the amount of student assistance given the instructor, the credit hour allowance per class on his total teaching load and the size of the large class. The situation differed greatly from course to course, with the result that some large experimental classes proved more costly than the control sections. In normal situations, however, increases in class size usually result in lowered student credit hour costs. Costs per student credit hour for large classes in the Study ranged from a low of $3.13 to a high of $12.41 with the average approximating $5.15. The range for control sections of the same courses was from $5.62 to $11.30 with the average approximating $7.60.

In the two courses in which experimental sections were taught by graduate assistants and control sections taught by regular faculty members the costs per student credit hour approximated $4.20 for the experimental and $6.70 for the control sections.

In is interesting to note that the costs of instructing students in large groups taught by regular faculty members is roughly the same as the costs of instruction to small groups taught by graduate student assistants.

It is again cautioned that the above figures are rough approximations of instructional costs per student semester credit hour. This problem will receive more careful study during the coming year so that the next report should carry more reliable data.



Floor Plans for Radio-Television Center Miami University